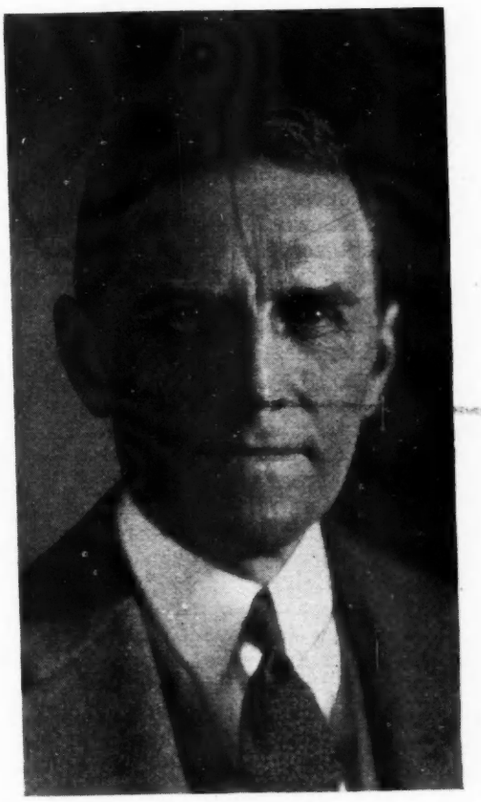
AUTOMOTIVE INDUSTRIES
VOLUME 65 SEPTEMBER 26, 1931 NUMBER 13

INSTALMENT AUTHORITY

Says time sales add $6,000,000,000 to Nation's Volume of Trade. Refutes claims of "strong-arm" methods as he

CHALLENGES CRITICS

by H. Bertram Lewis



Mr. Lewis says ". . . . . high proportion of instalment buying is done with thrifty motives . . . . . " + + +

THE automotive industry has such a vital interest in the promotion of sound thought on the subject of instalment merchandising that its leaders are justified in feeling some concern over any attempt to discredit the institution by misrepresenting its economic influence. It is therefore probable that a recent series of magazine contributions by critics of the principle has come to their attention and that a brief refutation of the trends of thought therein advanced will not be out of place in these columns.

Disappointed, apparently, at the unexpected liquidity demonstrated by instalment outstandings during the past two years, the bitter-end opponents of the system have returned to the attack with the purpose of fastening upon it the chief responsibility for the unprecedented length of the depression. Under the caption "Panics and Time Payments" a contributor to the April issue of Harper's endeavors to show that virtually the only difference between the present low and other depressions of great violence but of shorter duration is in the volume of instalment outstandings with which the American people were burdened in 1929, whose slow liquidation has prolonged the current slump. His thesis receives support from a message entitled "What Delays Revival—The Effect of Instalment Buying on the Return of Prosperity" which appears in the New Republic for June 10. And The American Mercury for August chimes in with a dirge entitled "The Finance Company Racket."

Now let it be said at once that instalment selling is no more fool-proof than any other human institution. No one knows better than a finance company executive the evils that might ensue from its abuse. They are no greater, it is true, than those which would follow the misuse of other forms of credit, but they undoubtedly exist. And no one can reasonably object to an analytical and balanced discussion of instalment economics. But lopsided thinking on a subject so crucial as this is exceed-

ingly dangerous at a juncture like the present.

The instalment plan is contributing some $6,000,000,000 annually to America's commercial volume—and thus to the maintaining of employment—even at this depressed stage. Unthinking condemnation of a principle so vital as that to our national welfare is destructive to the very last degree.

If these authors had based their conclusions on any of the known facts that have broad bearing on the subject one would have to credit them at least with fair intentions. But their method in each case has been either to postulate suppositions, or to state isolated situations whose actuality no one can disprove, and reason from these premises to the conclusions they have set out to establish.

Analyzed against the broad facts of the present instalment situation their contentions do not stand up at all.

One of them, for example, estimates the instalment debt of this country in 1929 as $250 for every family in the land. With 25,000,000 families that would give us a total of $6,250,000,000 instalment outstandings and an annual instalment sales volume of over $15,000,000,000.

Instalment Outstandings Never Above $2,500,000,000

The most authoritative figures available have not at any time placed instalment outstandings much in excess of $2,500,000,000 or shown a total annual volume of instalment business much beyond $6,000,000,000.

Another states the total of outstanding "consumer credit" as $10,500,000,000 and, implying that this entire sum represents instalment obligations, shows that more than one-fifth of the earned income of the American people (estimated at $50,000,000,000 for 1928) is mortgaged to the instalment collector. Actually, of course, with perhaps $2,300,000,000 instalment paper outstanding today and the total earned and unearned income of the people from $80,000,000,000 to $90,000,000,000 the ratio to reckon with is less than 3 per cent.

But what of this talk that the accumulated instalment debt of 1929 was an incubus that has weighed us down ever since and multiplied our troubles? Take the automobile picture, for example. The average automobile note of 1929 as reported to the National Association of Finance Companies covered a period of 9.3 months, and, as the average outstandings at a given moment represent a period of maturity approximately one-half as long as the duration of the average note of the prior twelve months' period it follows that the average automobile note due on Jan. 1, 1930, had some 4.65 months to run.

Finance company experience shows that the collection of this paper was but little more difficult than that of paper due in normal times, which means that the great bulk of it was liquidated before June 1, 1930, and that, almost to the last cent, it was out of the way before 1931. The paper in process of collection today is not for pre-depression debts. It represents new business volume, chiefly of the past six months, without which the depression would have been infinitely deeper than it was or is today. This paper of the depression period is also paying out at a rate but little slower than that of normal times. And as a result of all these favorable factors only two small finance companies out of a total of over 1000 are known to have gone under during the past two years. Compare that ratio with the ratios of commercial bank failures and estimate the relative liquidity of instalment paper in a time of stress as compared to other forms of credit.

But the critics do not rest their case wholly on this factor of debt. They charge the system with increasing the cost of merchandise and with ruthless exploitation of the poor man who cannot meet his payments on the dot. One writer intimates that finance companies profit so by their repossessions that their collectors stand ready to pounce at the first sign of weakening. The principle and its methods of use are attacked root and branch and the public is encouraged to regard it as unqualifiedly harmful.

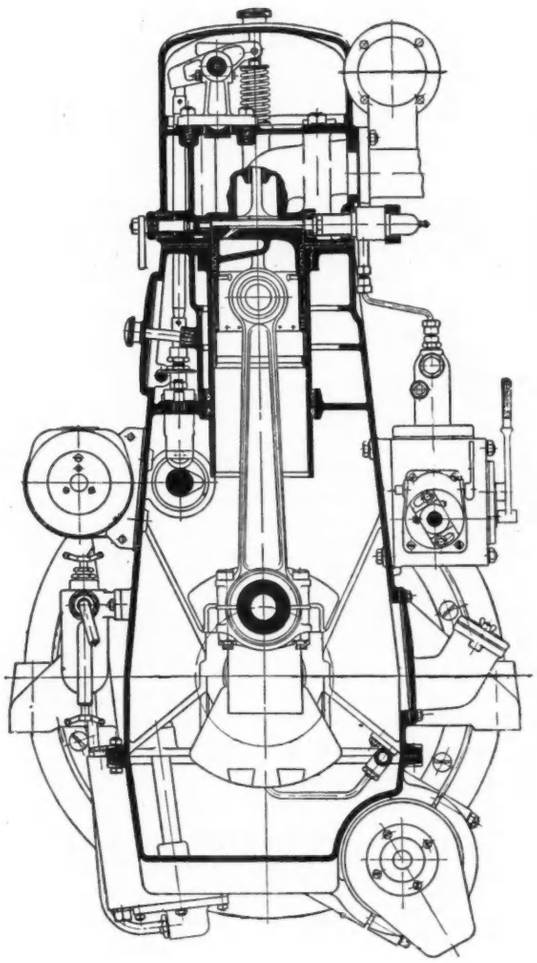
Now either these things are true or they are not. If they are they must be provable and in that case the system well deserves to be discarded.

If not, the facts must show it, and in that case adverse propagandists who disregard those facts should be rebuked, for they are doing their utmost not only to discredit the instalment plan, but to injure every industry that uses it. And the ultimate effect of their procedure, if carried to its logical conclusion, would be to injure all business directly or indirectly and to magnify the unemployment evil.

The facts do not sustain them. The time price of the average motor car exceeds its cash price by less than seven per cent. The finance charge is far lower, even in terms of true interest, than the cost of an equivalent loan payable on identical terms if procurable at the rates charged by small loan companies. It is not as low as the bank rate, of course, for the cost of money is only one of its ingredients, but the instalment plan is not intended for use by people who can borrow equal sums from banks on terms no less convenient and its cost is the lowest obtainable for equivalent accommodation, by any other class of purchaser. And of course the cash prices of many instalment-sold products would be appreciably higher than they are, except for the scale of production made possible by the instalment method of sale. Instalment collectors who know their business are not ruthless and finance companies do not make money on repossessed merchandise. It is obvious, of course, that severe collection methods, even if congenial to finance companies, would not be tolerated by the manufacturers and merchants whose goodwill asset would be undermined thereby.

Here and there, of course, instalment credit is extended unwisely. Now and then a merchant pads the finance charge and makes it look exorbitant. A poor collector will at times prove overzealous. But there has been absolutely nothing in the broad picture throughout the past two years—or ever in the history of the system—to prove it unsound either in thriving times or in an era of depression. In general it is undoubtedly a more conservative method of buying high priced utilities than that of paying cash from accumulated savings. The buyer who does that rarely pays the sum back to his savings account. The buyer who budgets his income to pay in instalments ends the transaction with title to the goods and his savings unimpaired. It is doubtless because a high proportion of all instalment buying is done with thrify motives that instalment credit has confounded the pessimists by its showing of stability since 1929.

M. A. N. Automotive Diesel Cuts Out Three Cylinders for Idling



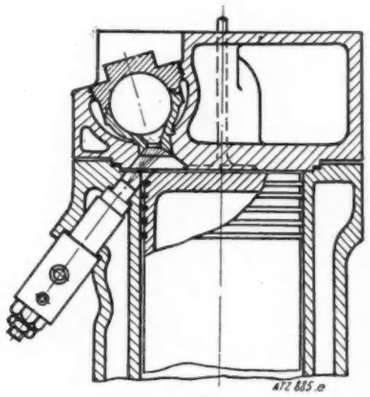
Section through M.A.N. air-chamber Diesel engine + + + +

NEW models of its automotive Diesel engine have been brought out recently by the Maschinenfabrik Augsburg - Nuernberg (M.A.N.), and one of these engines was shown at the stand of John Fowler & Co., Leeds, at the recent Royal Agricultural Show in England. The Fowler company has been using M.A.N. engines for its cable-plowing equipment for some years. An illustration of the engine showing a section through the cylinder is reproduced herewith. The cylinder dimensions remain the same as formerly, viz., 120 by 180 mm., or 4.73 by 7-09 in. At an operating speed of 1500 r.p.m. the six-cylinder engine (750 cu. in. displacement) develops 90 hp. This corresponds to a b.m.e.p. of 63.7 lb. p. sq. in. Fuel is injected directly into the combustion chamber, the atomizer being fitted into the wall of the cylinder head from the side. The compression space is in two parts, one between the cylinder head and the piston head and the other a pocket formed in the upper part of the piston, which communicates with the space between piston and cylinder head through an inclined passage. This arrangement is somewhat similar to the Acro system, except that in the latter the fuel is injected into the passage (or funnel) between the parts of the compression chamber in the cylinder and in the piston respectively.

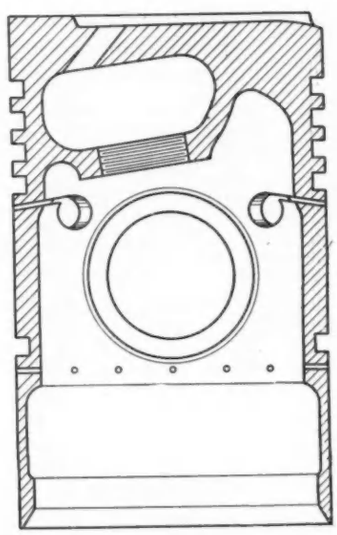
This arrangement is said to have the effect of slowing down the combustion and thereby preventing too fast a pressure rise. When the fuel is first injected there is insufficient air in the compression space between piston and cylinder head for the amount of fuel injected, which results in a retardation of the combustion process. As soon as the piston starts on its down-stroke the air in the pocket in the piston flows into the combustion chamber and is rendered available for combustion. Tests are said to have shown that no combustion takes place in the air pocket, hence no carbonization of the pocket walls can take place, and there is no likelihood of the piston overheating. The air flow into and out of the air pocket creates turbulence which improves the combustion, permits of higher speeds, and gives a clean exhaust.

From the sectional view it will be seen that the cylinders and crankcase are in a single casting which extends down below the crankshaft axis. The block is fitted with cylinder liners cast by the centrif-

(Turn to page 487, please)



Above—Section through upper part of cylinder + +



Right — Section of piston used in M.A.N. engine

JUST AMONG

Swope—Maker of History

"I FELT as though I were watching history in the making. It was the most important event that has happened in American industry in half a century. Its potential significance can scarcely be overestimated."

So spoke the president of an important and profit-making (even in 1931) manufacturing company the day after he had been present at the dinner of the National Electrical Manufacturers Association and listened to Gerard Swope's remarkable presentation of a plan to safeguard employer and worker and solve permanently the problem of "hard times."

Conversing informally, he went on to point out that some newspaper accounts had incorrectly recorded Owen Young's comments on the Swope plan when they indicated that Young was opposed to the governmental control phase of Swope's program. What Young really did say, this executive told us, was that industry was faced with the alternative of working out for itself some such plan as Swope proposed or of having its hand forced by restrictive legislation passed without economic understanding or soundness.

Idea Has Weight of Conservatism

UNQUESTIONABLY the Swope speech was an historic document. Its full significance has already been caught by major industrial leaders who for more than a decade have recognized the full social responsibility of industry but who, up to now, have been able only in small ways to find a means of assuming that responsibility in a practical manner.

Thousands of smaller business executives, to be sure, may see in the Swope speech nothing more than another interesting idea without definite practical relation to the everyday running of their business. But because of its source, the Swope speech will not be criticized by the average business man as "socialistic," "communistic" or "Bolshevist." Had almost anyone else delivered it, such criticisms almost certainly would have been made immediately by many business men.

Swope Plan is of Great Significance

WHETHER or not the Swope plan ever comes into practical use, its significance will remain great. For if it is passed off without intensive "follow-through" by American business, the alternatives indicated by Owen Young seem very likely to come about.

Probably every executive in the automotive industry has read at least the general outline of the Swope proposal. Many will want to read it over again in detail; to study it; to discuss it with other executives. For this reason, *Automotive Industries* has reprinted the speech in full on other pages of this issue.

Automotive Man Held Ideas Bearing On Swope's

PERSONALLY we never have felt so incapable of commenting intelligently on a subject of industrial importance. The vast possibilities of change opened up by this Swope speech cause rather a rush of speculations to the head and the consequent need of time and informal discussion for weeding out the sensible from the foolish.

Upon reading Swope's speech, however, we were immediately reminded of an interesting bit of personal correspondence which we had early in August with the vice-president and general manager of an automotive manufacturing concern located in a small Michigan town.

This executive wrote us at some length on July 31, suggesting that industry find some actuarial or accounting method of applying to all workers an insurance which would give them the same type of protection now provided to a few in special companies under special conditions. Replying to this most interesting letter (which we only wish space permitted reproduction of) we wrote the following comments, which now seem to us to bear on the Swope proposal, although written prior to its announcement:

Social Obligation is Forced on Industry

"VIEWED from a purely social angle, your concept seems thoroughly sound to me. If industry is to continue to control the lives of men—as it unquestionably does today—then eventually it must assume the fundamental obligations of providing a

OURSELVES

society in which the *average* individual can look forward to a reasonably protected old age or sickness period or unemployment period. Upon industry's ability—as well as upon its willingness to accept the obligations which arise from taking a social viewpoint of its functions—it seems to me, rests the ultimate stability or elimination of our present American economic system.

"The difficulty, as I see it, lies in the fact that 'industry' is a purely imaginary entity. 'Industry' actually is just a vast number of individually owned, operated and managed companies. And even those managers who accept the social obligations of an individual business find it extremely difficult to express their feeling of obligation in detailed action in the face of highly individualistic competition immediately against them.

Would Stockholders Profit in Long Run?

"YOU point out in your letter, for example, that 'if we utilize the productivity of the human without setting up a reserve to take care of its future protection, our costs may be lower and our profits to the stockholders may be greater. But what happens to that individual when he has passed the peak period of his normal effective working life?'

"He's out of luck, of course, unless he is among the few who have been able to provide for themselves by their own efforts.

"And who is going to take care of him, even though we develop the accounting methods which you suggest?

"Where the individual worker, through long service, is obviously a specific obligation of a specific company, that company often does make provision for him, as you point out.

Everybody's Business is Nobody's Business

"TROUBLE with the other fellows—who are in an overwhelming majority—is that they, although individual workers, do not—either individually or as a group—constitute an obvious obligation of any specific company; and, in our American economic system, the individual company is the only effective entity through which such an obligation can regularly be met.

"In other words, it seems as though we get back to the old truism that 'What's everybody's business is nobody's business.'"

Where Does the Responsibility Lie?

"THE basic necessity, as I see it, is first to find some means of fixing responsibility in some potentially effective and specific place for the care of industry's worn out human parts.

"The historical American concept has been that this responsibility rests entirely on the individual himself. That historical concept has been greatly modified both in thought and action during the last two decades. It is no longer accepted at all by the biggest industrialists and corporation heads in the country. But so far 'industry' has found no effective method of meeting these new social obligations which it accepts pretty well in theory, except through the particular activities of individual companies which comprise its constituents. Perhaps there is no other way. Perhaps that is ultimately the best way, but the very question of the itinerant worker which you raise so clearly in your letter is one of the strongest indications that some additional cooperative means of handling the situation may be necessary.

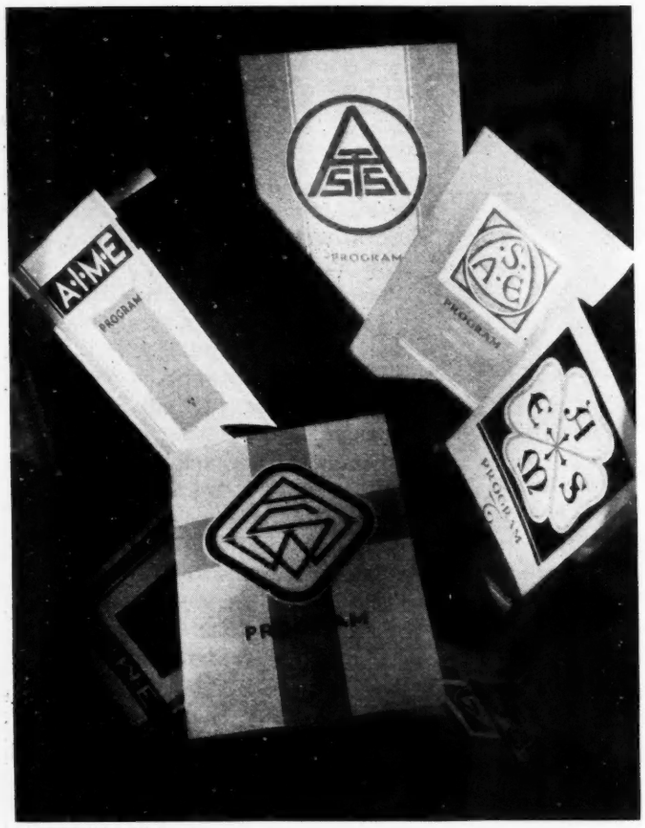
"I am in hearty agreement with the ideas expressed in your letter, but can't help but feel that the fixation and acceptance of responsibility for licking the problem may have to precede determination of specific means of licking it."

A Responsible Start Has Been Made

GERARD SWOPE, out of his experience and knowledge gained as the head of one of our largest and most successful corporations, has suggested a method of so fixing responsibility.

The important thing is that a start has been made by a responsible and outstanding representative of the group which controls the operation of industry—the group upon whom, under our American system, responsibility finally rests; the group which has the resources and the power to accomplish something once it sets out to do so.

Through such leadership American industry is certain to continue to prosper.—N.G.S.



CHILTON PHOTO

Metal Congress Greater Than

More than 100 technical papers and prepared addresses on the chemistry, metallurgy, machining, treating, testing and fabrication of metals were to be read before the five technical societies which opened the National Metal Congress in Boston on Sept. 21, under the auspices of the American Society for Steel Treating.

Cooperating associations were the Society of Automotive Engineers, American Society of Mechanical Engineers, American Institute of Mining and Metallurgical Engineers and the American Welding Society, each of which offered full programs for their members.

Preliminary registrations indicated that 60,000 would be in attendance.

The Exposition, held in the immense Commonwealth Pier, was the larger by 50 per cent than the 1930 showing of foundry and factory equipment and manufacturing and testing machinery and metals.

Herewith are presented abstracts of some of the more important papers of particular interest to automotive engineers and parts manufacturers.

Stretcher Strains Controlled By Initial Cold Work

WHEN the yield point of steel is reached in drawing, resistance to permanent deformation is overcome, according to Joseph Winlock and A. E. Lavergne, who discussed "Some Effects of Amount and Rate of Deformation of a Low-Carbon Strip Steel," at the Sept. 22 sheet steel session of the American Society of Steel Treating, National Metal Congress, Boston.

Tests of stretcher strains, known as "worms," were made by the authors, engineers for the Edw. G. Budd Mfg. Co., Philadelphia. These are irregular lines of depression or elevation which appear on sheet metal after it has passed through a drawing process, and are known to metallurgists as Lüder lines.

If the stresses producing them are primarily tensile, the lines appear as depressions in the surface; whereas if the stresses are primarily compressive, they appear as elevations. They tend to occur in those portions of stampings in which the elongation in forming is between 1.5 and 10 per cent.

In a previous A.S.S.T. paper, of which Mr. Winlock was a co-author, the formation of these lines was explained as due to the fluctuations of the stress-strain curve just beyond the yield point. These fluctuations are due to the transition of different grains (or groups of grains) from the elastic to the semi-plastic state. Severe surface markings can occur only if this transition is comparatively abrupt.

The surface markings decrease in magnitude as the load (due to the deformation) increases, and eventually there is a return to the original even surface. By performing a certain amount of cold work on the steel prior to the deep drawing operation, the stress-strain curve can be made comparatively smooth all the way to the point of fracture, and such treatment prevents the occurrence of stretcher strains, provided the material has not been allowed time to "age" or regain its original elasticity between the cold working and deep-drawing processes.

To throw further light on the effect of cold working in preventing the formation of stretcher strains, a series of tests were made on strip steel specimens. The steel contained 0.06 C., 0.36 Mn., less than

and Exposition at Boston 50 Per Cent 1930 With Attendance About 60,000

0.015 P. and 0.03 S. Tensile specimens were machined from a sheet of strip steel which had been hot-rolled from a slab to about 0.060 in. thickness, annealed, reduced by cold-rolling to 0.037 in. and finally box-annealed at 1400 deg. Fahr. Specimens were 0.750 in. wide and had gage lengths of 8 in.

Some of these specimens (the box-annealed group) were tested without further treatment, while the remainder (the normalized group) were sealed in pipes to prevent scaling, placed in a furnace which had been heated to 1750 deg. Fahr., held for three hours, and then drawn from the furnace and allowed to cool in the air.

Both groups showed the same elongation (31 per cent in 8 in.) when tested in the usual manner (2 in. elongation per minute). Both groups were then pulled at rates increasing in steps from 2 to 252 in. per min.

With the box-annealed specimens it was found that when the rate of elongation reached 19 in. p. m., the irregular lines of depression did not widen and disappear in every specimen, fracture occurring before parts of the specimen had permanently elongated. This so-called premature fracture occurred in at least five out of every eight specimens (four cut in the direction of rolling and four transverse to that direction), when the rate of pulling exceeded 19 in. p. m. When premature fracture occurred the rate of elongation in 8 in. was, of course, very small.

With the normalized specimens, stretcher strains appeared the same as with the box-annealed group, but these always widened and disappeared as the elongation increased. In no case did premature fracture occur with these specimens.

Box-annealed specimens were then pulled at 2 in. p. m. until all of the large depressions had appeared and disappeared, which required about 10 per cent elongation, and were then immediately pulled at 252 in. p. m. until fracture occurred. If this high rate of elongation had been applied in the first place, premature fracture would have occurred in every case, but by first stretching at a slow speed, which results in a certain amount of cold work being done on the specimen, premature fractures were completely eliminated.

In explanation of the results obtained the authors state that when the yield point of the steel is reached in the test, the resistance to permanent deformation is overcome, and slip begins. The intensity of the stress on the first grains to yield is increased by virtue of the reduction of area, but the work-strengthening of the grains also increases their resistance to further slip. The result is that the load-carrying capacity of the permanently deformed grains becomes greater than that of their neighbors which have been deformed elastically, or at most semi-plastically. It is fortunate that this is so, for otherwise steel could not be formed by the deep-drawing process; if the metal were perfectly plastic, the slightest concentration of stress would cause fracture.

Small User of Thin Strip Steel Given Method of Testing Stock

H. T. MORTON, metallurgist, and I. A. Rummler, assistant metallurgist of the Hoover Steel Ball Co., discussed "Thin Strip Steel for Deep Drawing," in which they outlined simple tests and the writing of specifications for thin strip steel for deep drawing purposes, such as ball and roller bearing retainers, bands, etc.

The data presented were intended chiefly for the small user of this class of material who has no Erichsen or similar cup-forming testing machine and must rely upon simplex test methods. The purpose of the tests here referred to is to determine whether the steel will work in a given deep drawing operation, without actually setting up the presses to form the parts.

The steel under consideration is purchased in the form of strips varying in thickness from 0.025 to 0.062 in. and from 1½ to 5 in. wide. It is used for roller-bearing cages, angular-contact ball bearing re-

Next Week—

Close-ups of the National Metal Exposition and Congress, Boston, will be presented next week by Joseph Geschelin, engineering editor of Automotive Industries, who is covering the Boston event. A part of this will appear on his weekly page, "Production Lines."

tainers, thrust-bearing bands, and ball-bearing retainers.

For the roller-bearing cages standard hot-rolled steel is used; for all other parts the steel is cold-rolled to size after the regular hot rolling operations, and annealed below the critical temperature to obtain the proper hardness and relieve any rolling strains. Both materials correspond to the S.A.E. No. 1010 specification.

The Rockwell hardness test is of greatest importance in order to get parts of uniform size from the dies, as Rockwell hardness has a direct relationship to the tensile strength, and an increase in the latter tends to cause the parts to flatten out or "spring back" to their original shape after release from the dies. Thus a range of Rockwell hardness, B scale, must be adopted in order to get uniformity of parts from the same shipment or successive shipments.

Production results showed that an increase in hardness beyond certain limits caused cracking of the parts at the edge of the bend with no definite relationship to the dies or the direction of rolling of the steel. A decrease in hardness below certain limits almost eliminated "spring-back" and made the steel "dead," but was detrimental in "loading up" the dies with metal, thereby causing them to badly scatch parts which were subsequently formed. Such dies would have to be repolished as soon as they "loaded up." Several types of lubricating oils have been tested and are effective in decreasing this "loading up" of metal on the dies.

Careful Comparisons Necessary

Careful comparisons of production results with Rockwell hardness values (B scale, 100-kg. load, 1/16-in. ball) indicate that for the parts formed 35-55 is the most satisfactory range for cold-rolled and 45-62 for hot-rolled steel. To obtain these hardness values the cold-rolled steel is given a final low-temperature anneal after rolling to correspond to dead soft steel, while the hot-rolled steel is finished at the proper temperature and slowly cooled without subsequent annealing.

Many of the larger companies employ Erichsen or similar cup-forming testing machines which combine a bend test, hardness test, elongation test, and surface test in one operation. If this equipment is not available a simple bend test can be used. Most companies recommend an 180-deg. bend of test specimens 1 in. wide by 6 in. long, which are bent upon themselves or upon material thickness to the test specimens. Transverse test specimens are 1 in. wide and of length equal to the width of the strips. This method of testing is satisfactory for the hot-rolled steel and requires that neither transverse nor longitudinal specimens break, crack, or show undue roughening of the surface.

For all other parts made of cold-rolled steel the transverse and longitudinal specimens must be bent 180 deg. upon a strip of equal thickness and straightened out flat without causing the inner surface to break, crack, or show undue roughening. At least six (under .5 per cent) strips are tested from every shipment.

Only in cases where trouble is encountered is the steel examined for micro structure. Where the surface roughens during the bend test, the structure (etched 70 seconds in 2 per cent nital) generally shows grain growth. Two causes of this grain growth are decarburization and recrystallization during annealing of cold-worked steel.

In many formed parts the edge is smooth enough so the parts can be used without trimming, while others are quite irregular. Production results indicate that the latter condition is found more often in parts made of cold-rolled than in parts made of hot-rolled steel. This irregularity of the edge is increased if the center of the strip is either harder or thicker than the edge. A safe tolerance on thickness across the strip is 0.002 in. and on hardness, 5 points.

Production results indicate that the latter condition is found more often on parts made from cold-rolled than from hot-rolled steel. Two factors were found to increase this irregularity of the edge, namely: having the centers of the strips harder or thicker than the edges. Safe tolerances for these two items are: maximum variation in Rockwell hardness across a strip, five points; maximum variation in thickness across a strip, 0.002 in.

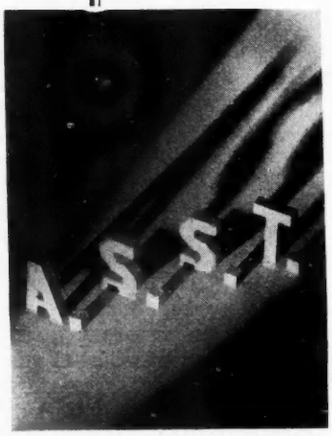
A small percentage of strips from each shipment should be examined for surface conditions, size tolerances, and internal defects to make certain that the finished parts will have the desired bright finish. Such defects may be listed as dark areas, seams, pipes, handling defects, and variation in tolerance.

Dark areas may originate from any of several causes, such as excessive scale on the hot-rolled steel, insufficient pickling, oxidation during annealing, and low spots on the hot-rolled strips. Their effect is to leave an irregular color on the finished parts, not removable without an extra amount of tumbling or added operations. These causes can be corrected by experienced mill operators.

Seams generally originate in the hot mill and are not removed during the cold rolling. An experienced inspector is needed to find them on rolled strips. Lack of detection weakens the parts and may cause a large number of split or broken parts.

Pipes can be detached by examining the sheared ends of the strips or by bending a short sample cut from the ends of the strips.

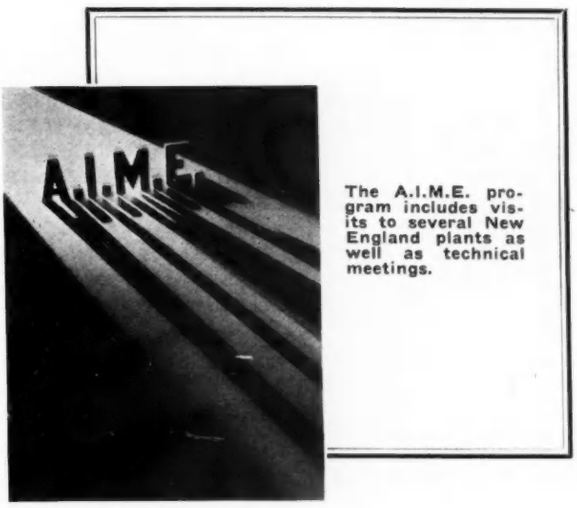
Where the quality of the finished parts requires a smooth surface free from dirt and roughness, and uniform in size, the steel must be handled carefully at the mill, in transit, and in production. Slight scratches, pits, laminations, indentations, etc., will



56 papers were listed on the A.S.S.T. program, the largest number ever presented at one time by the society.

pick up dirt and hard gritty material, thereby increasing these defects and causing size and surface irregularities during the forming operations. Sometimes this foreign matter will be embedded deep enough in the metal to require an added cleaning operation. Thus scratched, rough, or dirty strips and shipments should be cleaned or scrapped to prevent trouble.

Variations in thickness cause irregularities of the sheared edge of formed parts and such steel must not vary more than 0.002 in. across the strip. The allowable variation between strips depends upon the limits of the finished parts. Standard mill tolerances apply in the cases of most parts.



The A.I.M.E. program includes visits to several New England plants as well as technical meetings.

Uses X-Ray and Erichsen Cup To Test Grain of Sheet Steels

WILLIAM F. McGARRITY and H. V. Anderson, who presented a paper entitled "Effect of Normalizing on the Grain Structure and Physical Properties of Automobile Sheet Steel," described tests on such steel made by means of X-rays, photomicrographs and the Erichsen cup.

It was pointed out that normalizing has advantages over box annealing in that the time required is much shorter, heat treatment is more nearly uniform, and the required floor space is greatly reduced. With the elimination of the high depreciation of the cast iron boxes, the tonnage cost is the same.

Cold-worked specimens of commercial automobile fender stock were normalized at temperatures ranging from 1400 to 1800 deg. Fahr. X-ray diffraction patterns were obtained for each specimen, and photomicrographs were taken at 100-deg. intervals. Erichsen values gave a measure of the workability of the metal at the various temperatures.

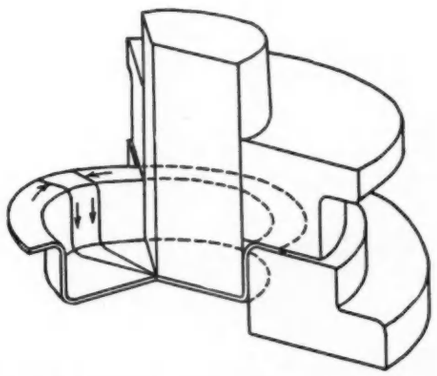
Increase in preheating time made no difference in the resulting structure, while increase in the soaking time gave slightly larger grain size and a more definite alignment of the crystals. A temperature of 1700-1750 deg. Fahr. gave the best structure, checking Erichsen tests. Directional properties were not completely removed after seven minutes' soaking at 1800 deg. Fahr.

Plastic Movement of Steel Occurs Beyond Elastic Limit

IN a paper on "Plastic Drawing of Sheet Steel Into E Shapes," E. V. Crane, staff engineer of the E. W. Bliss Co., pointed out that plastic movement of sheet steel in the drawing press occurs under stresses entirely beyond the elastic limit and well into the necking range of the tensile test, while sometimes even the stress represented by the point of fracture at the neck in the tensile test is reached.

The stresses which occur in drawing material may be studied to advantage on a round shell, as this involves balanced stresses only. Fig. 1 shows such a shell partly drawn through in tools which are shown cut away. The blank-holding ring holds the flat blank or disk against the surface of the die, to prevent the formation of wrinkles while the punch descends to draw the metal into a cylindrical shell.

If two lines had been drawn on the blank before starting the draw, starting at the center and deviating from each other by an angle of 15 deg., they would now appear as indicated by the lines marked with arrows. In the bottom of the shell the two lines make the same angle with each other, indicating that the metal there has not been disturbed. In the side wall the lines have become parallel, indicating distortion of the metal which increases with the distance from the bottom. In the flange the lines maintain the same angular relation, but they are drawn closer and closer together as the flange is drawn in and its circumference reduced. The most severely worked metal is that around the periphery of the blank, which has been rearranged



Sketch indicating nature of stresses in the material of the blank when drawing cylindrical shell

so that the circumference has become in the shell perhaps one-half of what it was in the blank.

In the illustration the vertical arrows denote the tension in the side wall, which is due directly to the pressure of the punch against the bottom of the shell. The two arrows on the flange indicate the crowding or compressive stresses set up in that part

of the blank. It is this induced compressive stress in the flange which must exceed the yield point before rearrangement of the metal begins.

The tendency to form wrinkles at various points in a drawn shape is one of the principal troubles encountered in drawing operations. This is due to the compressive stresses which, if the blank consists of comparatively thin material, cause it to buckle, unless such buckling is prevented by the blank-holding ring. In operations on heavy materials, such as that used in brake drums and wheel hubs, no blank-holding ring is required. The initial buckle or wrinkle is due to lack of uniformity in the resistance to movement in the cross section of the metal. A blank-holding pressure sufficient to resist this non-uniform movement prevents the buckle. Operations in which no blank-holding function is required are known as single-action drawing and redrawing, whereas operations in which a blank-holder is essential to prevent wrinkling are known as double-action drawing and redrawing.

There is a tendency to wrinkle also when a tapered shell is being drawn directly from a flat blank. The reason for this is that the inside diameters of the blank-holding and drawing rings are determined by the largest diameter of the taper, while the metal is being drawn down by the nose of the punch, which is equal in diameter to the small end of the taper. There is then a considerable area in which compressive reduction stresses are created, and if the metal is comparatively thin it is sure to wrinkle. For this reason many tapered parts are drawn first to a stepped profile of smaller diameter than the taper, and then expanded or stretched on the nose of a drawing punch into a tapered form. In the stretching operation no wrinkle-forming stresses are produced.

In many drawing operations on irregular shapes where there are reverse curves (as in an automobile fender, for instance), some portion of the metal may be subject to movement in compression over an area where blank-holding to prevent wrinkling cannot be arranged. More often, however, it is possible to so design the blank-holding surfaces with relation to the drawing profile that the metal which cannot be held flat between blank-holding surfaces is always in tension over a punch or pad surface.

The Technical Session of the Machine Shop Practice Division of the A.S.M.E. was held on Tuesday.

A burnished or polished outer wall surface indicates a reduction in wall thickness due to a clearance between the drawing punch and die which is less than the metal thickness.

Vertical surface scratches indicate that metal has picked up or welded on the drawing radius of the die.

Vertical cracks frequently start down from the raw top edge of the shell if the particular metal is being cold-worked excessively between anneals.

Frequently the surface of bright-finished stock will show evidences of the internal working the metal has undergone. Thus, over a corner radius and up the side the surface may change to a dull finish, with the appearance of a pebbled surface or a series of tiny bumps under magnification.

Extremely severe cold working will often produce a shell wall showing many minute fractures on its surface. This is an indication that too great a reduction is being taken between anneals, or that the metal used strain-hardens too rapidly for the particular operation.

For very shallow jobs, which include many automobile body parts, the metal must be pinched very tightly around the flange and stretched slightly beyond its elastic limit to hold its shape. When such metal has a high surface finish and yet is very soft or free from strain hardening, the slight movement of the metal involved may not be uniformly distributed over the whole area but localized along lines which leave patches and irregular-shaped areas untouched.

Shell breakage by tearing the bottom out is usually traceable to an excessive reduction.

Decomposition Takes Place Within Grains as Well as at Grain Boundaries

GRANULAR attack by corroding gases at high temperatures and grain-boundary decomposition or disintegration, which occurs when the sample has been heated for some time at 1000 to 1500 deg. Fahr., are limitations which have been experiences with the heat-resistant chromium-nickel and related alloys.

In a paper* presented before the A.S.S.T. stainless alloy session on Sept. 25, Dr. Vsevolod N. Krivobok and associates of the Carnegie Institute of Technology, pointed out that one of the theories regarding intergranular decomposition has been that:

At the high temperatures at which it occurs there is an excess of carbide, due to the steel being hypereutectoid;

In precipitating, the carbon associates with itself an unduly large proportion of chromium;

This chromium is drawn from the grain boundary areas which immediately surround the carbide.

These areas with their reduced chromium content are less resistant to corrosion.

The authors observed, however, that although the decomposition is most pronounced at the grain boundaries, it takes place within the grains as well, and they conclude that the subject deserves further study.

In the 18-8 alloys the carbide precipitation at 1300 deg. Fahr. is accompanied by the appearance of mag-

* "Further Studies on Chromium-Nickel-Iron and Related Alloys."

The S. A. E. presented three technical papers at its session on Wednesday.

netic constituents, whose presence is ascribed to transformation of austenite, which in turn is ascribed to a lowering of the stability when the chromium is withdrawn from the solution and precipitated in the carbide.

When it was observed that the alloys became less resistant to corrosion and at the same time became magnetic, it was perhaps natural to seek a relationship between the magnetic properties and the corrosion resistance. Indeed such a relationship was found to hold in the case of certain 18-8 alloys with various carbon contents. However, it soon became apparent that the corrosion phenomena depended on the extent of the carbide precipitation, whereas the magnetic phenomena depended on the amount of alloys, especially nickel, which might preserve the alloy nonmagnetic and yet permit it to show the corrosion phenomena.

Demonstrates Plasticity in Hardened High-Speed Steels

A HIGH-SPEED steel of the familiar 18-4-1 type has been investigated by Joseph V. Emmons, metallurgist of the Cleveland Twist Drill Co., who presented a paper on "Some Physical Properties of High-Speed Steel." Hardening and drawing temperatures were varied through wide ranges, and the effect of the variations on some of the physical properties of the steel was examined.

A measurable amount of plasticity was demonstrated in hardened high-speed steels at all heat treatments. The variations in the plasticity appeared to be governed largely by the troostite content of the structure.

The strength of hardened high-speed steel appeared to be largely dependent upon the quantity and nature of the martensite present. The addition of a small quantity of troostite appeared to aid the strength by supplying sufficient plasticity to permit a better distribution of the stresses.

A structure of martensite which appears to be distinct from the familiar needles, termed "vermiform martensite" by the author.

In a previous paper the same author described a torsion test for determining the strength, plasticity and toughness, the latter quality being defined as a property depending on strength and plasticity. In the paper presented at this meeting the toughness of the various test specimens was calculated. While the toughness as thus defined may have no scientific significance, it is believed to be useful in a practical way.

The hardness appeared to be governed by the amount of martensite present. Austenite and troostite when present, acted to lower the hardness.

Finds Soft Steel Improves With Age

IT has been found that soft steel, the same as duralumin, has the property of improving with age with respect to its mechanical qualities, and an investigation of the factors on which this quality chiefly depends has been made by A. Allan Bates, instructor at Case School of Applied Science, Cleveland, who discussed the results in a paper entitled "Aging in Low Carbon Steels." The specimens tested contained 0.026 per cent C., 0.032 per cent S., 0.34 per cent Mn., 0.03 per cent Si., and 0.07 per cent P.

First the effect of the quenching temperature was investigated, and it was found that there was a maximum improvement in both the tensile strength and elastic limit with age for a quenching temperature of 1290 deg. Fahr., a minimum for a quenching temperature of 1560 deg. and another maximum for a quenching temperature of 1710 deg. The degree of improvement by aging is comparable to that obtained in duralumin and other aluminum alloys. By suitable controlled aging, the author asserts, the tensile strength, elastic limit and Brinell hardness of low carbon steel may be increased 50 per cent or more.

The aging is due mainly, the author found, to a sub-microscopic precipitate of carbides within the ferrite grains. The hardness conferred upon the steel by the precipitate is inversely proportional to the size of the individual particles of the precipitate.

The precipitation, which at room temperature requires from 25 to 30 days for its completion, can be tremendously speeded up by heating the steel to comparatively low temperatures. Thus 30 minutes at 212 deg. Fahr. causes a very notable precipitation hardening.

Age-hardening may be entirely prevented by a sufficiently slow cooling of the steel from about 1330 deg. Fahr., or by a draw of suitable length at temperatures of 212 deg. Fahr. and over.

Reviews Progress With Energizers in Carburization

GEORGE M. ENOS, of the University of Cincinnati, in a paper presented by him, discussed the effects of various materials as energizers in carburization, with particular reference to the transfer of carbon from the compound to the iron. His paper,

read on Sept. 25 before the A.S.S.T., was entitled "Role of Energizers in Carburizing Compounds."

The experimental work on which the paper is based is still in progress, and no definite conclusions were drawn. Certain observations made in the course of the tests were as follows:

Carbonates as such are not needed as energizers in carburizing compounds. It may be that considerations of cost and convenience make it desirable to add energizers to the compound as carbonates.

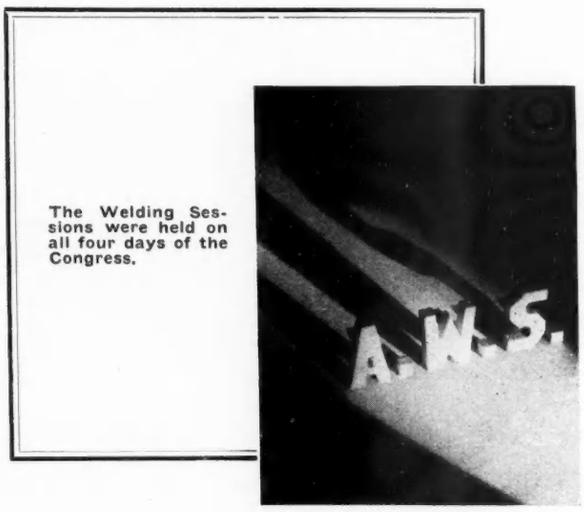
There are a number of materials which will act as positive catalysts or energizers for the process of carburization.

There are other materials which will act to retard carburization as to case depth and carbon concentration.

When only pure carbon is used as a packing material a case is obtained which is very shallow and of low carbon concentration. Pure carbon can be energized by various materials, even as unlikely a one as silica.

When oxygen of the air is not available, i. e., when the carburizing container is swept with nitrogen, only those energizers which can be readily decomposed to yield oxygen show any effect. Under these conditions it would seem that their sole role is to produce oxygen-carbon compounds or oxygen-iron compounds.

No sample of carburizing compound was reused and hence no comparison can be made of those tested as to commercial efficiency. However, there is no reason to believe that with a proper method of binding, the energizers studied would not give repeated results of the same order as here indicated.



The Welding Sessions were held on all four days of the Congress.

Inert Materials and Salt Bath Used to Improve Nitriding

MANY potential users of the nitriding process are reluctant to discard the older methods of case hardening because of the slowness of the nitriding process as practiced in the past, said John J. Egan, of the Carbide & Carbon Research Laboratories, in a paper on "Short-Time Nitriding," before the A.S.S.T. session, Sept. 25.

He pointed out that many small parts require extreme surface hardness for wear resistance but no great depth of case. By the use of ammonia alone an appreciable case thickness cannot be produced in less than 10 to 15 hours.

Two methods for reducing the time of nitriding have been developed in the laboratories, one consisting in the use of inert materials as packing in the usual ammonia treatment, and the other in the use of a salt bath. These methods have been further improved recently, and other means for expediting the process have been discovered.

Experimental work was carried out on two steels, known respectively as Nitralloy 630 and Nitralloy 125, the former a chrome-vanadium and the latter a chrome-aluminum steel. Surface hardnesses were measured by the Monotron and Rockwell B scales, after which the depth of case was determined under tne microscope.

It was pointed out in the paper that the hardness of such extremely thin layers as produced in these tests is very hard to determine accurately. The hardness of the specimens is said to be of the same order as that of work nitrided in the conventional way, nominally 1000 Brinell.

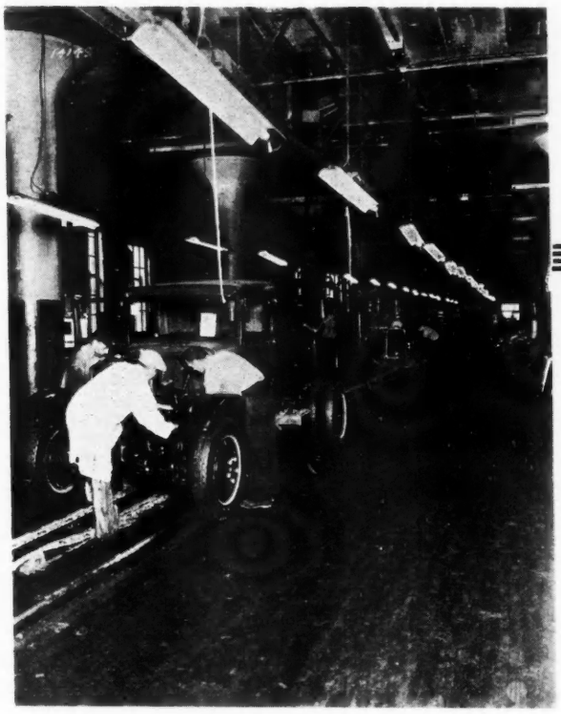
Wear resistance tests made in a special machine also showed the results from the short-time process to be equal to that obtained with the ordinary nitriding process. All of the processes tried by the author of the paper gave satisfactory hardness in four hours.

The salt bath used in one process consists of 47 per cent potassium cyanide and 53 per cent sodium cyanide. Originally the steel was treated in this bath for two hours, which gave a case thickness of about 0.0005 in. It was found that the case thickness increased with the temperature used, and further work showed that successive two-hour treatments at 1025 and 860 deg. Fahr. for chrome-vanadium, and 1200 and 950 deg. Fahr. for aluminum-bearing steel resulted in the most satisfactory properties. The hardness was equal to the best obtained with the single low-temperature treatment, and the case-depths were increased to 0.004-0.005 in. This process already is in successful commercial use.

In a search for more efficient gaseous nitriding media, experiments were made with mixtures of ammonia and nitric oxide, which on being heated react to form nitrogen and water vapor. Appreciable cases were obtained in 2½ hours, and it was found that copper gauze acted as an efficient catalyst, resulting in deeper cases, and that as the theoretical proportion of the mixture of 60 per cent nitric oxide was approached, the properties of the case improved. Nitric oxide alone had no effect.

When inert material was used as packing the dissociation of the ammonia was considerably greater than the usual 25-30 per cent. In spite of this, excellent cases were obtained, which suggested that this low dissociation was not essential to successful nitriding, and various means of increasing the dissociation were investigated. One such means consisted in the provision of spark terminals inside the container in the immediate vicinity of the work. These experiments with electric sparks in the container were made with both metal and vitreosil containers,

(Turn to page 492, please)



PRODUCTION LINES

Production Lines of the Industry No. 5

S.P.A. trucks coming off the new assembly line. View taken in the Studebaker plant at South Bend. The first lot of 1½-ton trucks came off the line Sept. 30, 1930 + + +

Production Surfacing Files

A line of surfacing files recommended for soft materials like babbitt, aluminum, etc., as well as the hard metals such as tool steel and cast iron, has been placed on the market by the Production Engineering Co., Spokane, Wash.

These files are for filing flat, true faces and are useful in all classes of manufacturing and repair work. They may be used on the principle of a plane. Or the handle may be held in a vise with the flat side of the file upward and the work drawn over the file. Or the handle may be removed and the file fastened to a bench with two small wooden screws and the work drawn over the files. In manufacturing, light machining may be avoided by their use. These files are made of a special alloy which is said to be from 18 per cent to 25 per cent harder than carbon steel files. Toothroats or gullets are rounded out to assure that the files will always keep clean and not clog up with loose material.

This Changing World

New metals, new alloys, new processes are constantly shifting our conception of the properties of engineering materials. Yet these properties underlie engineering design and production methods. *Research Group News*, July, 1931 (published by the American Foundrymen's Association), suggests the following check-list of Property-Factors. It is by no means complete. Perhaps your experience will suggest some others.

1. Ultimate Strength under Tension
2. Yield Point under Tension
3. Elongation under Tension
4. Reduction of Area under Tension
5. Resistance to Impact
6. Resistance to Fatigue
7. Resistance to Internal Pressure
8. Resistance to Compression
9. Resistance to Corrosion
10. Resistance to Abrasion
11. Resistance to Erosion
12. Resistance to Torsion
13. Resistance to Shear
14. Resistance to High Temperature
15. Resistance to Low Temperature
16. Electrical Properties
17. Machinability
18. Interior Soundness
19. Surface Smoothness
20. Uniformity of Quality, per Grade
21. Variability of Quality, by Grades
22. Inherent Repairability
23. Fabricating and Assembling Adaptability
24. Dimensional Accuracy
25. Time Needed for Complete Manufacture
26. Purchase Price

Bearing Down

Lots of people thinking about permanent mold casting these days. Naturally, only where production warrants the method. Result, better looking castings, more uniformity, less finish allowance—if any.

Old Turnings

According to Prof. J. W. Roe, the early boring tools had no support at the outboard end. The resulting work was naturally rather inaccurate. In 1774, John Wilkinson hit upon the idea of making the boring bar heavier, running it clear through the cylinder, and giving it a fixed support at the outboard end. High-pressure cylinders followed almost as a matter of course.

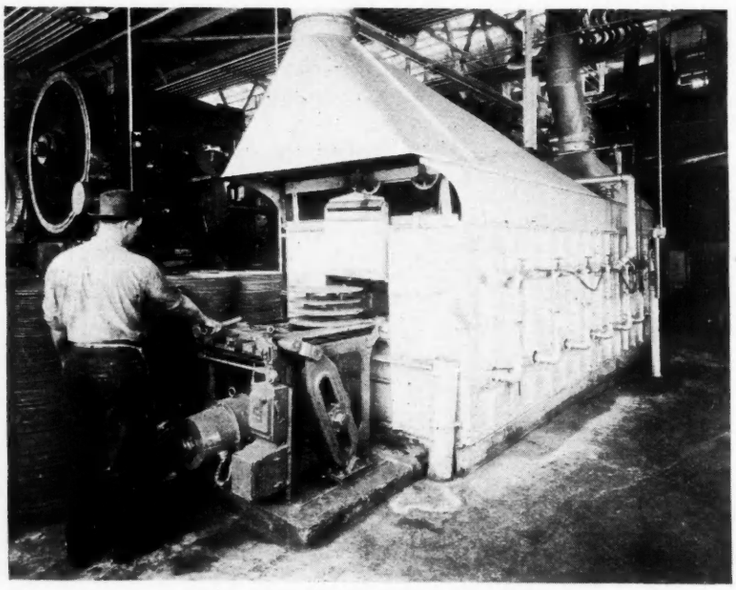
Supremacy in 1932

Supremacy will come as result of good engineering ideas—predicts Norman G. Shidle in *Automotive Industries*, Sept. 5, 1931. His discussion centers about new design ideas in automobiles and component parts. Add to this another field of engineering—that of manufacturing equipment. It has been the writer's privilege to visit many machine tool builders' plants recently. And although manufacturing activities have been curtailed in many cases, engineering and research has carried on. Judging from our observations, so many important improvements have been made recently that existing equipment simply will not pay. Before long most plants will have to get some of this new equipment if they are to forge ahead.—J. G.

MANUFACTURING MANAGEMENT METALLURGY

Continuous Gas Furnace and Large 400 Brake Drums in Eight Hours

The furnace is equipped with a pyrometer which operates a set of warning lights and keeps the heat within 10 deg. of the temperature set upon it + + + + + + + + + +



The furnace is 20 ft. long and is designed for continuous use. It is semi-automatic + + + + + +

INVOLVING the use of a giant power press and a large continuous gas fired furnace, the automobile brake drum, as made at the plant of the Lincoln Motor Car Co. affords an excellent example of deep drawing heavy stock on a mass production basis. The stock is a high carbon, high manganese steel plate a half inch thick. Blanks 23 inches in diameter are used and these are heated and then formed to the approximate shape of the brake drum in a single operation of the press.

The press used weighs 125 tons and will exert a pressure of 1000 to 1500 tons. For forming the brake drum the press is equipped with a punch and die, the die having a cylindrical hole in the center, slightly larger than the finished drum. The hot blank is positioned in the press over this die and the punch descends and forces it through the die, forming the flange of the drum against the sides of the hole in the die. The ram and punch are forced down by back geared cranks and the length of stroke of the press, after contacting the hot blank, is 20 inches, in order to carry the blank through the die to the ejecting position.

A clamping cushion actuated by compressed air is used to keep the blank from slipping while forming and a pit 16 ft. deep, under the press to accommodate this, is part of the equipment. The pneumatic die cushion is a feature which has been introduced for metal drawing work, on single acting presses, to provide uniform pressure on all sides of the blank. It also reduces excessive strain on the press by a high tension at the end of the stroke.

The type installed on the press described is fastened to the press by means of four suspension rods attached to the web of the press. Usually this type cushion is attached to the underside of the press bed but may also be fastened to the bolster plate. A pressure pad bottom against the underside of the press bed was a special requirement in this case. There is also a center knockout which strips the formed blank from the punch and as the punch comes to the end of its stroke the formed drum is pushed out from under the die for delivery through a slot in the back of the die. The die and punch are lubricated with heavy cylinder oil and the punch is water cooled.

The setup for making these brake drums includes besides the press, a gas furnace. At the discharge end of the furnace is a short roller conveyor running direct to the press. An operator with tongs takes a hot blank as it is discharged from the furnace and guides it down the roller conveyor directly into the press. A crew of three men will turn out 400 brake drum pressings in a single shift of 8 hours.

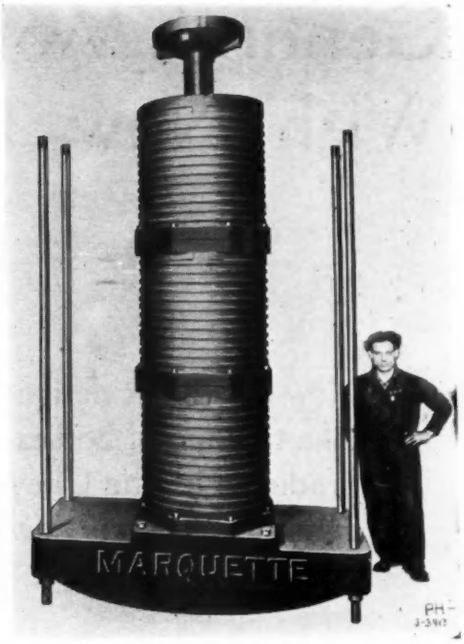
The furnace is designed for continuous use, is semi-automatic in operation and is constructed of brick, suitably insulated and encased in steel. This furnace is 20 ft. long, 6 ft. high and 6 ft. wide, and is heated with seven gas burners on each side, or 14 in all. The

Press Turn Out for Lincoln Cars

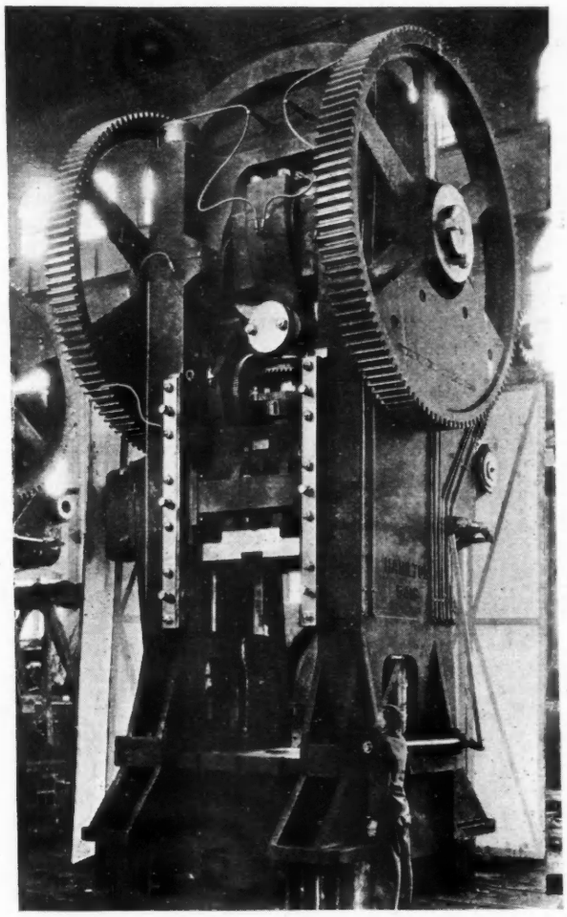
by J. B. Nealey
American Gas Association

method of firing is below the hearth, the heat rising around the sides and behind a baffle wall a foot high, constructed of refractory material. The heat rises until it strikes the arch where it is reflected and radiated down on the work.

A separate manifold supplies gas to each group of seven burners and each manifold is provided with an inspirator. Gas is supplied at 12 lb. pressure and air is inspirated in any proportion to give a reducing,



A pit 16 ft. deep under the press accommodates this clamping cushion + +



This big press weighs 125 tons and will exert a pressure of 1000 to 1500 tons + + + + +

oxidizing, or neutral fuel flame within the furnace. In this case a neutral flame is necessary to prevent oxidizing the surfaces of the blanks. Once set the correct gas-air ratio is automatically maintained regardless of the volume of work going through the furnace. Waste heat is removed through take-off flues at each end and exhausted through a hood and duct with fan to the outside of the building.

On each side of the bottom of the furnace are lengths of U-shaped alloy castings with short legs which rest upon the hearth and extend lengthwise through the furnace forming continuous grooved rails. Pieces of iron pipe of suitable diameter to slide in these rails and of a length slightly greater than the diameter of the blanks to be heated, are placed on the rails, one on each side, and a drum blank is laid on these pipes. Upon this blank is placed a pronged circular ring of alloy casting which acts as a spacer and, upon which another blank is placed, and blanks are then stacked four high, thus providing a space between the hearth and the first blank and between the blanks themselves for uniform circulation of the fuel flame which speeds up and materially aids in uniform heating. When a stock of blanks is ready, the furnace door is raised and a motor-driven pusher, operated through a link and cross head, pushes the loaded pipes along the rails and delivers the stack within the furnace. This stacking and delivery finally fill the furnace and the first stack entering the furnace is eventually at the delivery end fully heated. The press operator withdraws the hot blanks for the press operation and delivers the spacers and pipes to the charging end of the furnace for reuse in loading.

This furnace is equipped with a recording pyrometer which also operates three lights, red, green and white. These lights switch on and off automatically and the pyrometer operates them within 10 deg., plus or minus, of the temperature set upon it.

General Motors Enters Lower Price With New 1½ to 2-Ton Model at

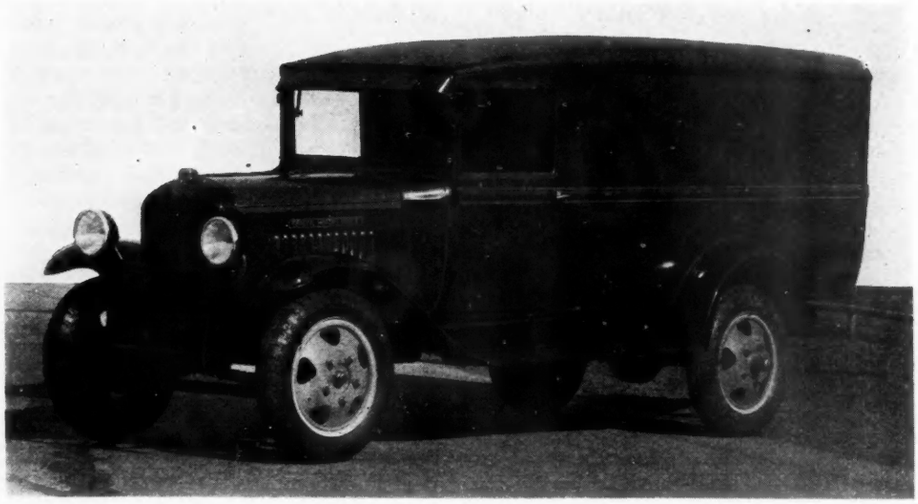
New offering is designed to take the line of bodies now produced by the Chevrolet commercial body division

FROM $595 to $665 is the price range for the T-18, 1½ to 2-ton General Motors Truck Company's newest offering, the lowest priced truck ever produced by this company. Powered with the same six-cylinder 60 hp. powerplant as the T-19 and the former T-17, the truck is made available in two wheelbases, 131 and 157 in., permitting 9 to 12 ft. body lengths and with a maximum gross rating of 8200 lb.

While the new truck in itself is exceptionally low in price, still further savings are pointed out by G.M.T. in delivered prices. The truck has been designed to take the line of bodies now produced by Chevrolet's commercial body division, with the national distribution and national pricing of these bodies. Thus a 131 in. wheelbase single tire T-18, complete with cab and platform body, for instance, can be purchased by the consumer for $755 plus the low uniform national handling price of the commercial body division, and the freight plus handling charge of the truck itself from Pontiac to the point of purchase. The cab itself lists at $105.

General specifications of the truck appear in the accompanying table. In addition some other points should be noted. The engine is supported at three points, with one mounting at the front and two at the rear. A suction type crankcase ventilator, an air cleaner and fuel strainer provide protection against dirt and fumes. The worm type steering gear of own make is mounted on roller bearings for easy handling, torque and propulsion are taken by means of a torque tube, and brakes are of the General Motors Houck type, with four shoes in the rear drums, two of which are operated through the hand lever. Service brakes are four-wheel mechanical, cable and rod operated. A feature on the new T-18 is the use of demountable Spokesteel wheels, simplifying interchange of wheels and conversion from single to dual tire equipment, etc.

A fin and tube type radiator is fitted to the T-18,



G.M.T. 1½ to 2-ton truck chassis listing at $595, fitted with panel body. The body with integral cab lists at $240, and is obtainable from the Chevrolet commercial body division depots all over the country + +

Truck Field $595 to $665

G.M.T. 1½ to 2-ton truck, the new model T-18, fitted with platform stake body. The latter lists at $85 for the 131 in. wheelbase chassis shown here. The cab is $105 + + + + + + + + +

Specifications of the T-18

Wheelbase	131 in.	157 in.
Chassis price	$595	$665
Gross vehicle weight,		
single tires	7500	8200
dual tires	8200	8200
Chassis wt. stripped	2700	2890
Tires, front	30x5 t.t.	30x5 t.t.
Tires rear single	32x6 t.t.	32x6 h.d.
duals	30x5 t.t. (ex. cost)	30x5 t.t.
Engine make and model	Own	
No. of cyls.	6	
Bore and stroke	3 5/16 x 3⅞	
Piston displacement	200.3	
Carburetor make	Marvel	
Fuel feed	AC pump	
Electrical system	Delco-Remy	
Radiator make	Long	
Clutch make	Own	
type	single plate	
Transmission make	Own	
location	unit powerplant	
No. forward speeds	4	
Rear axle make	Own	
type	semi-floating	
final drive	spiral bevel	
final ratio	5.428:1	
Brakes, service	4-wh. mechanical	
drum, dia. front	11½ in.	
rear	16 in.	

with black enameled shell. The tubes are of the flat type, providing insurance against bursting in case of freezing. In such a case the tubes would change to circular section. The core, produced by Long Mfg. Co., is supported on rubber pads.

On the 157 in. wheelbase chassis two universal joints are used, the forward unit at the transmission and the rear universal carried at the front of the torque tube, supported in ball bearings on a frame cross member. Clutch release bearings are of the ball type. An accelerating pump is fitted to the automatic air valve carburetor. Provision is made in the starter drive to prevent accidental meshing of the starter pinion while the engine is running.

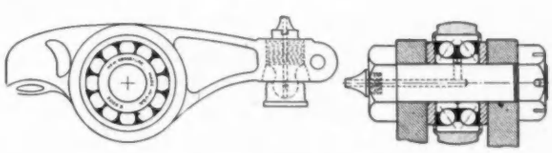
Instrument panels are indirectly illuminated and equipped with electric dash gas gage, and water temperature indicator in addition to the usual instruments. All electric wiring is protected by flexible conduits.

With the revised set-up General Motors Truck is in a better condition to attract dealers than ever before.

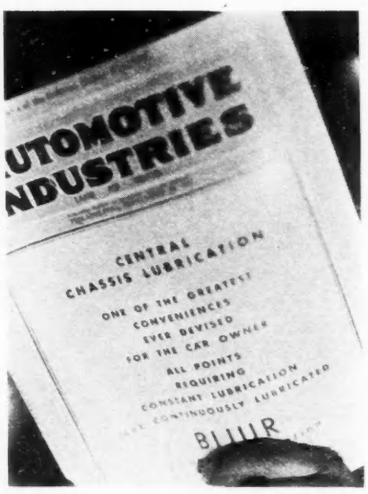
Rocker Arm of Aircraft Engine Has Ball Bearing

THE drawing shown herewith is of the rocker arm on the Continental aircraft engine which is fitted with a New Departure double-row, angular-contact ball bearing. Since the motion is purely oscillatory, no cage is required for the bearing and the latter is of the "full" type, that is, it contains the maximum possible number of balls. Grease can be forced into the bearing, a lubrication fitting being screwed into the head of the pin. The inner faces of the two-piece inner race of the bearing are so ground that when firmly clamped together at the time of installation all end play in the bearing is eliminated. This is said not to restrict the freedom of movement in the bearing but to add greatly to its rigidity. The ground washers on both sides of the bearing are of such a diameter that they just clear the bearing outer ring, so the grease is well retained.

The adjusting screw at the end of the rocker arm, which incorporates a spherical seat for the ball end of the pushrod, is also provided with a lubricating fitting.



Continental aircraft engine valve-rocker arm with ball bearing + + + +



The Forum

Why Not a Simplified System of Truck Rating?

Editor, AUTOMOTIVE INDUSTRIES:

All this pother about truck ratings is interesting—even if not illuminating. Why make it so complicated when two or three simple statements of fact (usually carefully hidden from the public) would serve 99 per cent of the needs for a rating very adequately?

Martin Pulcher's paper at White Sulphur, when considered with his wealth of experience as a builder and vendor of trucks, shows clearly how futile it is to attempt to get anything of value out of a comparison of present ratings.

Friend Buckendale also did a careful and capable job of listing many factors involved in the various calculations that some seem to think every truck salesman should be well acquainted with.

And now P. M. Heldt uses a question mark for the title of his article and suggests that tires—the most often changed and easiest changeable specification—should be a part of the rating. If you study the standard tire equipment of the thirty 1½ ton trucks you may find that the lighter (inferentially overrated) units are proportionately overtired as compared with their heavier (overrated?) contemporaries.

Since it is all so complicated, why not throw it all out and secure two simple statements of fact which will enable any competent user to decide for himself?

Let the N.A.C.C. or S.A.E. supervise (as they do all official contest records) and secure from each builder:

1. A standard S.A.E. horsepower—torque—fuel consumption chart based on standard production set-up, including both regular accessory equipment and adjustment, with standard fuel temperatures and pressures.
2. The weight of the standard chassis complete ready for service less body, cab, and pay load, *and* the weight of the same less powerplant and its accessories, i.e., just axles with springs and wheels (but less standard tires) and the frame.

It really is amusing to hear the different stories a to the means employed to achieve some advertised horsepower ratings. A comparable dynamometer test should be very interesting even if embarrassing.

The two weight figures are suggested to see what the tare weight really is before you load the truck as well as accepting Heldt's theory that the weight of the carrying member may, after all, be the most feasible means of comparing weight capacity, and avoids discussion as to cast iron or alloy steel.

All of the formulae discussed in the papers mentioned above mean absolutely nothing without accurate information on the above points. If it were available, however, any average operator could work out his own solution from the general specifications now generally broadcast.

RING GEAR.

Laws of Bearing Friction

Editor, AUTOMOTIVE INDUSTRIES:

Commenting upon the article appearing in your Aug. 15 issue by P. M. Heldt, entitled "Friction is Independent of Load in Well-Lubricated Bearings," this is thought to embody a number of broad statements of a misleading nature to which exception might properly be taken.

Starting with the first paragraph, all recent experimental data certainly do not tend to show that friction is practically independent of the load. Even when the rubbing velocity is sufficiently high to impart ample load-carrying power to a well-lubricated journal, it can be shown from authoritative tests that the resulting friction coefficient is more likely to vary inversely as the square root of the sustained load, especially so when the journal fit is a relatively loose one. While the "well lubricated" portion of the title implies an ample supply of oil, that does not vitally alter the cited pressure relationship.

Presumably the statements criticized are intended to include automobile engine journals of the reciprocative type and the like, but there the bearing fit must be kept quite close, so close, in fact, that it becomes virtually impossible to freely establish a perfect film between these snugly fitted rubbing surfaces. Such film restraint does not necessarily signify rapid bearing wear, since but a slight rupture in the oil film is sufficient to augment the friction coefficient to a considerable degree, and thus change the characteristic of bearing behavior when subjected to pressure increase.

As presented before the annual S.A.E. meeting of January, 1930, the writer coordinated the results of some 28 leading friction tests as conducted under widely different operating conditions. These findings make manifest that the resulting friction coefficients do not generally conform to the dictum that is here being challenged. The cited S.A.E. paper further makes an approximate check upon the total friction losses that are likely to occur in the modern automobile engine, and concludes that roughly less than one-third of such power wastage may be ascribed to main bearing and crankpin friction. In the case of more nearly perfect lubrication, said automobile bearing friction might conceivably be reduced

to about one-third of its estimated value, but any such achievement does not for the present fall within reasonable expectations.

Furthermore, it is not seen wherein some of the earlier experimental determinations are in reality so faulty as the article under discussion would have us believe. Towers' classic tests made some 50 years ago, check up well with more recent determinations when conducted under similar circumstances. In fact, the assumptions underlying the current hydrodynamic theory of friction were in part based upon Towers' test results.

In view of these aspects, it is questioned whether progress would not be retarded rather than advanced, if as advocated, we were to throw over the conception of a conventional friction coefficient. Neither does a well-designed ring-oiler bearing, which lifts oil from its well, reveal any marked deviation from Towers' oil-bath friction coefficient, where the operating conditions are otherwise kept identical. Other earlier experiments such as those of Lasche, show no large difference between the oil-well temperature and that measured closely adjacent to the rubbing surfaces, at least not to a degree that would be likely to invalidate these earlier findings or point to a materially higher temperature within the film proper.

With reference to the Zn/p relation which it is alleged correctly represents the theoretical basic ratio by which friction variation should be measured, this issue has been disputed by the writer in the discussion of his cited S.A.E. paper (see Journal, June, 1930), and the substance thereof need not be repeated here.

In this connection, reference is made to the more recent Bulletin No. 39 of the Pennsylvania State College (September, 1930), by L. J. Bradford and L. J. Grunder, entitled "Oil Film Pressures in Complete Bearing." To quote from the concluding remarks (see pp. 23 and 31):

"The first and most striking result obtained was the fact that the pressure distribution within the oil film differed widely from that indicated by the classical theory. . . . It does show that in a cylindrical sleeve bearing of the type dealt with in this investigation, supplied with oil from one end, the assumed conditions are not present, and that serious errors in both eccentricity and pressure distribution will be incurred by applying Harrison's equation for a full bearing to the type of bearing dealt with here."

This and like pertinent experimental findings raise the question whether the alleged Zn/p bearing relation is a correct one except possibly when restricted to a limited set of operating circumstances such as fail to respond to those generally met with in practice. The entire theory of lubrication is evidently in need of a radical recasting in order to bring it into better agreement with actualities and the indications are that we shall ultimately be obliged to turn back and reconsider our fundamental conceptions regarding friction behavior. In the writer's opinion, the most fruitful and at the same time trustworthy procedure is first to fix upon bearing behavior on the basis of an empirical coordination and thereby more clearly bring out the underlying factors that control such behavior, all of which might now be determined from the vast store of information contained in test data that have already found their way into our friction literature.

The writer's analytical investigation is cast along these lines, and throws some light upon the intricate nature of observed friction phenomena. As a result of the cited survey, it is found that bearings seldom if ever work with strictly perfect film lubrication, because of a certain degree of metal-to-metal contact, and that the most that can apparently be accomplished in the present state of the art, is to approach the desired criterion as closely as possible. Finally, it has not as yet been indubitably proven that friction losses invariably change directly with the angular speed or the oil viscosity as has been assumed; on the contrary, some root or possibly logarithmic function of unit pressure, rubbing velocity and viscosity more nearly represent the determining factors sought.

LOUIS ILLMER,
Research Engineer,
The Brewer-Titchener Corp.

Diesel Engines on English Buses

Editor, AUTOMOTIVE INDUSTRIES:

"With reference to letter from P. J. F. Batenburg, headed 'Sees Bright Diesel Future,' the writer of this note has some little experience with heavy oil engines used for bus work in England.

"In Manchester we have 50-seater double deck buses running regularly fitted with heavy oil engines. One of the routes has eight compulsory stops per mile. The fuel consumption works out at 11 miles per gallon, the weight of the vehicle loaded being 10 tons or 22,400 lb. Similar buses fitted with petrol engines are doing 6 miles per gallon on the same route.

"The heavy oil engine has six cylinders, 4¼ in. x 6 in. bore and stroke, and the petrol engine, 6 cylinders 4¼ in. x 5½ in. bore and stroke. The maximum speed allowed is 30 m.p.h. The time table is easily adhered to by either type of bus, the axle ratio for the oil-engined bus being 5.75 to 1, and the petrol bus 6.25 to 1."

T. D. WISHART,
Chief Designer,
Crossley Motors, Ltd.,
Manchester, Eng.

Spark Advance and Compression

Editor, AUTOMOTIVE INDUSTRIES:

The Forum of the July 18th issue of *Automotive Industries* carried a letter from Mr. Minter and Mr. Finn stating that spark advance for any fixed set of engine conditions is proportional to combustion chamber volume. We wish to corroborate these findings and point out that this relationship is very significant in connection with gasoline knock-testing.

In 1929 steps were undertaken to develop a spark advance control linkage for the Cooperative Fuel Research Committee engine which would automatically give the optimum spark setting for any compression ratio at which the variable compression cylinder might be set. The spark curve for maximum power over a range of compression ratios was obtained when using an aromatic fuel of high anti-knock value, which is necessary in order to obtain a smooth curve. This indicated the spark advance to be proportional to the combustion chamber volume, which permitted the simplest type of linkage between the movable cylinder and spark lines to automatically give the correct spark position for any ratio.

H. L. Horning's paper on the C.F.R. engine given before the American Petroleum Institute in Chicago in 1930 and before the S.A.E. in Detroit in 1931 described this feature, which is now part of the regular equipment on the Cooperative Fuel Research Committee engine.

A. W. POPE, JR.,
Waukesha Motor Company
Engineering Department.

Plan Presented to Stabilize Industry

Intensified Trade Association Activity for All Inter-State Businesses Urged by President of General Electric Co. + +

IN THE situation that confronts us at the present, the most disturbing aspect is that men who are able to work, who are competent workers, who above all things desire to work, cannot find work to do. That this condition has ever been present in such periods detracts nothing from its wrongness. That industry must evolve and make effective those measures which will first ameliorate and ultimately eliminate it, must be the reaction of everyone who gives thought to what is taking place. I say that industry must do this thing, because it will surely be done.

Benefits earned by a worker in one employment are wholly or in large measure lost by forced changes, or the right of choice of employment, which should be inalienable, is hampered. From the operation of individual life insurance and pension systems, however well conceived, has arisen the complaint of the "forty-year dead line," which, it is claimed, has seriously affected the ability of men exceeding that age to find new employment. Wide application is essential if benefits gained in one location are to follow the worker as necessity may indicate change of location, and this is a vital factor of any plan which will meet the need. If there were provided in the United States a system of benefits accruing through the life of the worker and following him where he might go, from shop to shop within a particular industry, or from branch to branch within industry as a whole, such provision would enlist not merely interest on the part of the worker, but enthusiastic support.

Industry exists basically for serving the needs of the people, and therefore production and consumption must be coordinated. Consumption is by the mass of the population, not the few, and the great mass of the population is made up of wage earners and their dependents. That they may be able to buy and satisfy their needs, they must have not only adequate incomes, but must be sufficiently assured of the future to feel that they are safe in spending their money. The psychology of fear must be removed, and this cannot be done unless they have reasonable expectation of protection for their families in case of the breadwinner's death, protection for their old age, and protection against unemployment. By "protection" I do not mean a protection that is given to them, but I mean protection that they themselves help to provide.

Shall we wait for society to act through its legislatures, or shall industry recognize its obligation to its employees and to the public and undertake the task? Coordination of production is impossible under our present laws, and it is vain to think of their amendment or repeal unless the public is assured of the constructive nature of the steps industry will take, and that the interests of the public will be adequately safeguarded.

The general principles underlying what I am going to say are as follows:

1. Every effort should be made to stabilize industry and thereby stabilize employment to give to the worker regularity and continuity of employment, and when this is impracticable, Unemployment Insurance should be provided.

2. Organized industry should take the lead, recognizing its responsibility to its employees, to the public, and to its stockholders—rather than that democratic society should act through its government. If the various States act, industry will be confronted with different solutions, lacking uniformity and imposing varying burdens, making competition on a national scale difficult. If either the individual States or the Federal Government act, the power of taxation has no economic restraints.

3. There should be standardized forms of reports so that stockholders may be properly informed. As a result of the steady increase in number and size of corporations and number of shareholders, there has been much discussion of the uniformity, frequency, and regularity of reports of corporate activities, and considerable criticism of the form of these reports; some too conservative, some not sufficiently complete; while others are considered to be fair and complete, but even so there is a lack of uniformity among the different companies.

4. Production and consumption should be coordinated on a broader and more intelligent basis, thus tending to regularize employment and thereby removing fear from the minds of the workers as to continuity of employment; as to their surviving dependents in case of death; and as to old age. This should be done preferably by the joint participation and joint administration of management and employees. These things cannot be done by an individual unit—organized industry must do them.

5. If organized industry is to undertake this work, every effort should be made to preserve the benefits of individual originality, initiative, and enterprise, and to see that the public is assured that its interests will be protected, and this can be done most effectively by working through the agency of the Federal Government.

There is nothing new or original in what I am proposing. I am merely bringing together well-considered propositions that have found support, including some that have been put into actual practice.

The following plan is offered as a means to correlate into a comprehensive whole the at present undirected efforts of forward-looking business enterprises toward stabilization; for the further development of industry and commerce; for the protection of employees and stockholders; for the best service to the public and in general the best interests of society. Legislation will be required to make such a plan possible, including the probable modification of some existing laws.

An outline of the more important features follows:

1. All industrial and commercial companies (including subsidiaries) with 50 or more employees, and doing an interstate business, may form a trade association which shall be under the supervision of a federal body referred to later.

2. These trade associations may outline trade practices, business ethics, methods of standard accounting and cost practice, standard forms of balance sheet and earnings statement, etc., and may collect and distribute information on volume of business transacted, inventories of merchandise on hand, simplification and standardization of products, stabilization of prices, and all matters which may arise from time to time relating to the growth and development of industry and

Through Trade Pact

By Gerard Swope*

Gerard Swope, President of General Electric Co.

commerce in order to promote stabilization of employment and give the best service to the public. Much of this sort of exchange of information and data is already being carried on by trade associations now in existence. A great deal more valuable work of this character is possible.

3. The public interest shall be protected by the supervision of companies and trade associations by the Federal Trade Commission or by a bureau of the Department of Commerce or by some federal supervisory body specially constituted.

4. All companies within the scope of this plan shall be required to adopt standard accounting and cost systems and standardized forms of balance sheet and earnings statement. These systems and forms may differ for the different industries, but will follow a uniform plan for each industry as adopted by the trade association and approved by the federal supervisory body.

5. All companies with participants or stockholders numbering 25 or more, and living in more than one state, shall send to its participants or stockholders and to the supervisory body at least once each quarter a statement of their business and earnings in the prescribed form. At least once each year they shall send to the participants or stockholders and to the supervisory body a complete balance sheet and earnings statement in the prescribed form. In this way the owners will be kept informed of the conditions of the business in such detail that there may be no criticism of irregularity or infrequency of statements or methods of presentation.

6. The federal supervisory body shall cooperate with the Internal Revenue Department and the trade associations in developing for each industry standardized forms of balance sheet and income statement, depending upon the character of the business, for the purpose of reconciling methods of reporting assets and income with the basis of values and income calculated for federal tax purposes.

7. All of the companies of the character described herein may immediately adopt the provisions of this plan but shall be required to do so within 3 years unless the time is extended by the federal supervisory body. Similar companies formed after the plan becomes effective may come in at once but shall be required to come in before the expiration of 3 years from the date of their organization unless the time is extended by the federal supervisory body.

8. For the protection of employees, the following plans shall be adopted by all of these companies:

(A) A WORKMEN'S COMPENSATION ACT, which is part of the legislation necessary under this plan, shall, after careful study, be modeled after the best features of the laws which have been enacted by the several states.

(B) LIFE AND DISABILITY INSURANCE. All employees of companies included in this plan may, after two years of service with such companies, and shall, before the expiration of five years of service, be covered by life and disability insurance.

I. The form of policy shall be determined by the association of which the company is a member and approved by the federal supervisory body. The policy will belong to the employee and may be retained by him and kept in full force when he changes his employment or otherwise discontinues particular service as outlined later.

II. The face value of a policy shall be for an amount approximately equal to one year's pay, but not more than $5,000, with the exception that the employee may, if he desires, increase at his own cost the amount of insurance carried, subject to the approval of the Board of Administrators, later defined.

III. The cost of this life and disability insurance shall be paid one-half by the employee and one-half by the company for which he works, with the following exception: The company's cost shall be determined on the basis of premiums at actual age of employees less than 35 years old and on the basis of 35 years of age for all employees 35 or over and shall be a face value of approximately one-half a year's pay but limited to a maximum premium for $2,500 of insurance. An employee taking out insurance at age 35 or over will pay the excess premium over the amount based upon age 35. This will remove the necessity for restriction against engaging employees or transferring them from one company to another because of advanced age, as it will place no undue burden of high premiums upon the company.

IV. The life and disability insurance may be carried by a life insurance company selected by the trade association and approved by the federal supervisory body or may be carried by a company organized by the trade association and approved by the federal supervisory body, or a single company may be formed to serve all associations.

V. The administration of the insurance plan for each company shall be under the direction of a Board of Administrators consisting of representatives, one-half appointed by the management and one-half elected by the employee members. The powers and duties of the Board for each company will be to formulate general rules relating to eligibility

* In his address before the Annual Meeting National Electrical Mfrs. Association.

of employees, etc., but such rules shall be in consonance with the general plan laid down by the General Board of Administration of the trade association of which the company is a member, and approved by the federal supervisory body.

VI. Provision for the continuation of a policy after an employee leaves one company and goes to another in the same association, or goes to a company in another trade association; continuance of the policy after retirement on pension; provisions with regard to beneficiaries; total or partial disability; method of payment of premiums by payroll deductions or otherwise, weekly, monthly or annually, shall be embodied in the plan formulated by the trade association, with the approval of the federal supervisory body.

VII. If an employee leaves a company to go with one which is not a member of the trade association; if he engages in business for himself; or if he withdraws from industrial or commercial occupation, he may elect to retain the portion of the policy for which he has paid, in whole or in part, by the continued payment of the proportional full premium costs, or he may receive a paid up policy, or be be paid the cash surrender value for the part for which he has been paying the premiums. The cash surrender value of that portion of the policy paid for by the company will be paid to the company which paid the premiums.

(C) PENSIONS. All employees of companies included in this plan shall be covered by old age pension plans which will be adopted by the trade associations and approved by the federal supervisory body. The principal provisions will be as follows:

I. All employees may, after two years of service with a company coming within the scope of this plan, and shall, before the expiration of five years of service, be covered by the old age pension plan.

II. All employees after two years' service may, and after five years' service shall be required, to put aside a minimum of one per cent of earnings, but not more than $50 per year, for the pension fund. The employee may, if he desires, put aside a larger amount, subject to the approval of the Board of Administrators.

III. The company shall be required to put aside an amount equal to the minimum stated above, namely one per cent of earnings of employees, but not more than $50 per year per employee.

IV. The above minimum percentage shall be the same for all employees who are less than 35 years of age when payments begin and the minimum percentage for these employees shall remain the same thereafter. The percentage to be set aside by employees coming into the pension plan at 35 years of age or over shall be so determined that it will provide a retiring allowance at age 70 the same as though they had begun one per cent payments at the age of 35. These provisions enable employees to go from one company to another in the same association or to different associations at any age with provision for retiring allowance which will be not less than the minimum rate of an employee who entered the pension plan at age 35.

V. The amounts set aside by the employee and the company with interest compounded semi-annually at per five cent until retirement at age 70, for a typical average employee, would provide an annuity of approximately one-half pay.

VI. The administration of the pension plan for each company shall be under the direction of a Board of Administrators, consisting of representatives, one-half appointed by the management and one-half elected by the employee members. The powers and duties of the Board for each company will be to formulate general rules relating to elegibility of employees, conditions of retirement, etc., but such rules shall be in consonance with the general plan laid down by the General Board of Administration of the trade association of which the company is a member, and approved by the federal supervisory body.

VII. The amounts collected from the employees and the companies shall be placed with a pension trust organized by the association, the management of which shall be under the direction of the General Board of Administration referred to hereafter. In no case shall such funds be left under the control of an individual company.

VIII. The pension trust shall invest all funds and place them to the credit of the individual employees, including the income earned by the trust. If an employee goes from one company to another in the same association, the funds accumulated to his credit shall be continued to his credit with proper record of transfer. If an employee goes to a company in another association, the funds accumulated to his credit shall be transferred to his credit in the pension trust of the association to which he goes. If an employee goes to a company which does not come under these provisions or which is not a member of a trade association; goes into business for himself; or withdraws from an industrial or commercial occupation, the amount of his payments plus the interest at the average rate earned by the funds shall be given to him. If an employee dies before reaching retirement age, his beneficiary will receive the amount of his payments plus interest at the average rate earned by the funds. When an employee reaches retirement age, the entire amount accumulated to his credit, including his own payments and those of the company, plus accumulated interest, will be given to him in the form of an annuity. If an employee goes to a company which does not come under these provisions or which is not a member of a trade association; goes into business for himself; or withdraws from industrial or commercial occupation, he may elect to let the amount to his credit (namely, his own payments plus those of the company and the accumulated interest) remain with the pension trust for transfer, if he should return to the employ of any company coming within the provisions of this plan. If he does not return to the employ of a company coming under these provisions, he may at any time thereafter withdraw the amount of his own payments plus interest at the average rate earned by the funds up to that time. Company contributions and accumulated interest credited to employees who die, or for reasons indicated above, receive or withdraw their own contributions and interest, shall be returned to the employer or employers who made the contributions.

IX. The rules governing the payments of pensions on retirement and all other rules governing its continuance shall be made by the trade association, approved by the federal supervisory body, and observed by the General Board of Administration and the Boards of Administration of the member companies.

(D) UNEMPLOYMENT INSURANCE. All employees on piece work, hourly work, daily, weekly, or monthly work, with normal pay of $5,000 per year or less (approximately $96.15 per week) shall be covered by unemployment insurance.

I. All such employees may, after two years of service with a company coming within the provisions of this plan, and shall, after five years of service, be each required to put aside a minimum of one per cent of earnings, but not more than $50 per year for an unemployment insurance fund.

II. The company shall be required to put aside an amount equal to that put aside by the employees, as set forth above, namely, one per cent of the

earnings of each employee, but not more than $50 per year for each such employee.

III. If a company regularizes and guarantees employment for at least 50 per cent of the normal wage paid each year to such employees, the company assessment for employees covered by such guarantee need not be made, but the employees will pay in a minimum of one per cent of earnings, but not more than $50 per year, into a special fund for their own benefit.

If such an employee leaves the company, dies, or retires on pension, the amount to his credit in the special fund, plus interest at the average rate earned by the special fund, shall be given to him or to his beneficiaries or added to his pension.

IV. If a company so plans its work that it is able to reduce unemployment, when the amount of such company's credit in the normal unemployment fund is equal to but not less than 5 per cent of the normal annual earnings of the employees covered, the company may cease making payment to the fund. Employees' payments will continue. The company will resume payments when its credit in the normal unemployment fund falls below 5 per cent of normal annual earnings of the employees covered.

V. When the weekly payments made from the fund for unemployment benefits amount to 2 per cent or more of the average weekly earnings of participating employees, the company shall declare an unemployment emergency, and normal payments by the employees and the company shall cease. Thereafter *all* employees of the company (including the highest officers) receiving 50 per cent or more of their average full-time earnings shall pay 1 per cent of their current earnings to the unemployment fund. A similar amount shall be paid into the fund by the company. The unemployment emergency shall continue until normal conditions are restored, which shall be determined by the Board of Administrators of each company. Thereupon normal payments will be resumed.

VI. The main provisions for the distribution of the funds shall follow along these lines, unless modified by the Board of Administrators as set forth in section D, paragraph VII hereof. A certain small percentage of the normal payments of the employees and the company may be considered as available for helping participating employees in need. A larger percentage of such normal payments may be considered as available for loans to participating employees in amounts not exceeding $200 each, with or without interest as may be determined by the Board. The balance of the funds shall be available for unemployment payments. Unemployment payments shall begin after the first two weeks of unemployment and shall amount to approximately 50 per cent of the participating employee's average weekly or monthly earnings for full time, but in no case more than $20 per week. Such payments to individual employees shall continue for no longer than ten weeks in any twelve consecutive months unless extended by the Board. When a participating employee is working part-time because of lack of work and receiving less than 50 per cent of his average weekly or monthly earnings for full time, he shall be eligible for payments to be made from the fund, amounting to the difference between the amount he is receiving as wages from the company and the maximum he may be entitled to as outlined above.

VII. The custody and investment of funds and administration of the unemployment insurance plan for each company shall be under the direction of a Board of Administrators consisting of representatives, one-half appointed by the management and one-half elected by the employee members. The powers and duties of the Board shall be to formulate general rules relating to eligibility of employees, the waiting period before benefits are paid, amounts of benefits and how long they shall continue in any year, whether loans shall be made in time of unemployment or need, whether a portion of the funds shall be placed at the disposal of the Board for relief from need arising from causes other than unemployment, etc., but such rules shall be in consonance with the general plan laid down by the General Board of Administration of the trade association of which the company is a member, and approved by the federal supervisory body.

VIII. If an employee leaves the company and goes to work for another company coming within the provisions of this plan, the proportionate amount remaining of his normal contributions, plus interest at the average rate earned by the funds, shall be transferred to such company and to his credit. If he leaves for other reasons, dies, or retires on pension, the proportionate amount remaining of his normal payment, plus interest at the average rate earned by the funds, shall be given to him, or to his beneficiary, or added to his pension. When such employee's credit is transferred to another company, or paid to the employee or to his beneficiary under this provision, an equal amount shall be paid to the cooperating company.

GENERAL ADMINISTRATION. Each trade association will form a General Board of Administration which shall consist of nine members, three to be elected or appointed by the association, three to be elected by the employees of the member companies, and three, representing the public, to be appointed by the federal supervisory body. The members of the General Board, except employee representatives, shall serve without compensation. The employee representatives shall be paid their regular rates of pay for time devoted to Board work, and all members shall be paid traveling expenses, all of which shall be borne by the trade association. The powers and duties of this General Board shall be to interpret the life and disability insurance, pension and unemployment insurance plans adopted by the trade association and approved by the federal supervisory body, supervise the individual company Boards of Administration, form and direct a pension trust for the custody, investment, and disbursements of the pension funds, and in general supervise and direct all activities connected with life and disability insurance, pension and unemployment insurance plans.

CONCLUSION. The foregoing plan tends to put all domestic corporations of the class described on a parity for domestic business, thereby removing the inequalities of the different laws in the several states, provides for standard forms of financial reports and their periodical issuance for the information of stockholders, places on organized industry the obligation of coordinating production and consumption, and of a higher degree of stabilization. This will tend to assure more uniform and continuous employment for the worker and to remove fear from his mind, allowing him to devote himself wholeheartedly to his task. Cost of the product will include these items and will therefore be paid for by the users of the article or service and not in general by members of the community reached by the vicarious method of the imposition of a tax. Then organized industry will be in the position that it should rightly assume of serving the public, with public confidence and with the joint participation of workmen and management in the solution of these vital and far-reaching problems.

ADDENDUM

The following provision is suggested to place domestic corporations of the sort described on a parity with foreign competition: Any company engaged in export business may, upon application to and approval by the federal supervisory body, deduct from its federal income tax the equiv-

(*Turn to page 485, please*)

Installation of Modern Equipment Cost in Production of Pinion

Power-Flex Automatic Chucking Machine effects economies which will quickly offset its cost

CUTTING floor-to-floor time from 28 minutes to 11 minutes per piece on a heavy duty operation is an achievement well worth studying. It was accomplished recently by the installation of modern equipment in a well-known truck manufacturing plant.

Much has been said lately in these pages about the increased productivity of modern machine tools and the revolutionary changes that are taking place in machine shop practice thereby. The case study made here is conclusive evidence of the new order. Moreover it demonstrates the practicability of paying for the new machine from savings.

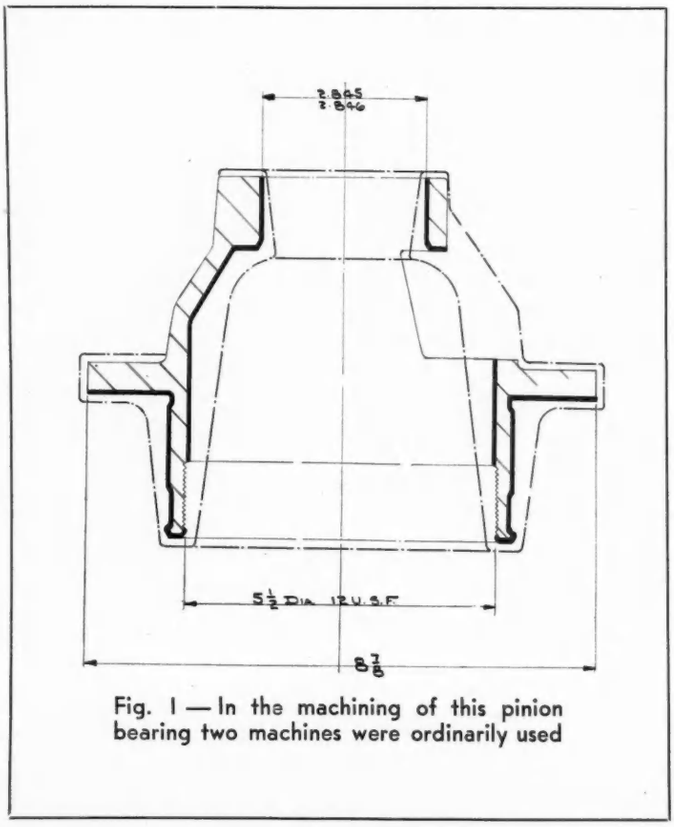


Fig. 1 — In the machining of this pinion bearing two machines were ordinarily used

This study was prompted by facts leading to the replacement of two model 6-A Potter & Johnston automatic chucking machines by one of the latest P&J, 5-D Power-Flex Machines. In the machining of the pinion bearing cage shown in Fig. 1, two 6-A machines were ordinarily used—one performing the roughing operation, and the other the finishing operation. The combined machining time was twenty-eight minutes floor to floor, which involved the removal of approximately fifteen pounds of stock. The surfaces as indicated were finished in these two holdings with the exception of the threading. Because of the slotting operation, which necessarily followed those performed on Automatics, it was and is still necessary to finish tap in a subsequent holding.

A careful study of the set-up as outlined indicated that these two holdings could be performed in one operation on the latest model 5-D Power-Flex Automatic Chucking Machine at a saving in cost which would amply justify the required investment. In actual practice, the installation of the 5-D has been fully justified, as the present floor to floor time is eleven minutes as compared to the twenty-eight minute time already quoted. The saving according to the revised cost records is 15 cents per piece.

Fig. 2 shows in good detail the tooling for the new set-up on the 5-D machine. As a matter of interest the following gives briefly the operations performed at each of the five turret stations:

1. The work is gripped on the flange in a three jaw air chuck and during the first turret face the excessive raft is removed from the bore by means of the three cutters shown in the boring bar; the draft is also removed from the outside of the hub by a tool carried in the turning stem directly over the center. At the same time the front cross slide operates and the two tools shown face off the flange and the hub respectively.

2. On the second turret face, the bottom of the hole is faced and formed with a special multiple blade cutter head. Note that the work is cut away and that this heavy form tool is operating on a broken cut. The multiple blade tool was purposely used so as to

Cuts Time and Bearing Cages

always have two or three blades operating on the work, while the remaining blades were in the open. During this interval a second cut is taken on the outside of the hub.

3. The tools on the third turret face are for finish boring both holes, and for boring the thread diameter. Simultaneously the rear cross slide is in operation and the flange and hub are finish-faced, and the groove is machined in the hub.

4. On the fourth turret face both holes are reamed. This is carried in the pilot bar, but the holes are reamed with reamers of the floating block type.

5. On the fifth turret face the threads are machined with an automatic releasing tap.

As mentioned earlier because of the slotting operation which necessarily follows those performed on the Automatic, it was, and still is, necessary to finish tap at a subsequent holding.

Obviously there are a number of distinct economies due to the new set-up. The saving in cost reflects only those due to increased productivity and the reduction in handling. But what of the saving in floor space? One machine has taken the place of two, releasing valuable space for other purposes. It is precisely by this method that many manufacturers have been able to increase output without adding to the plant. And that is the reason why in many cases a modern machine is justified even if it does not pay for itself out of savings within a short time. Certainly you can buy a lot of manufacturing equipment for the price of a plant addition.

Productivity, decreased handling, and savings in productive floor space are mighty good yardsticks to use when you are seeking new economies.

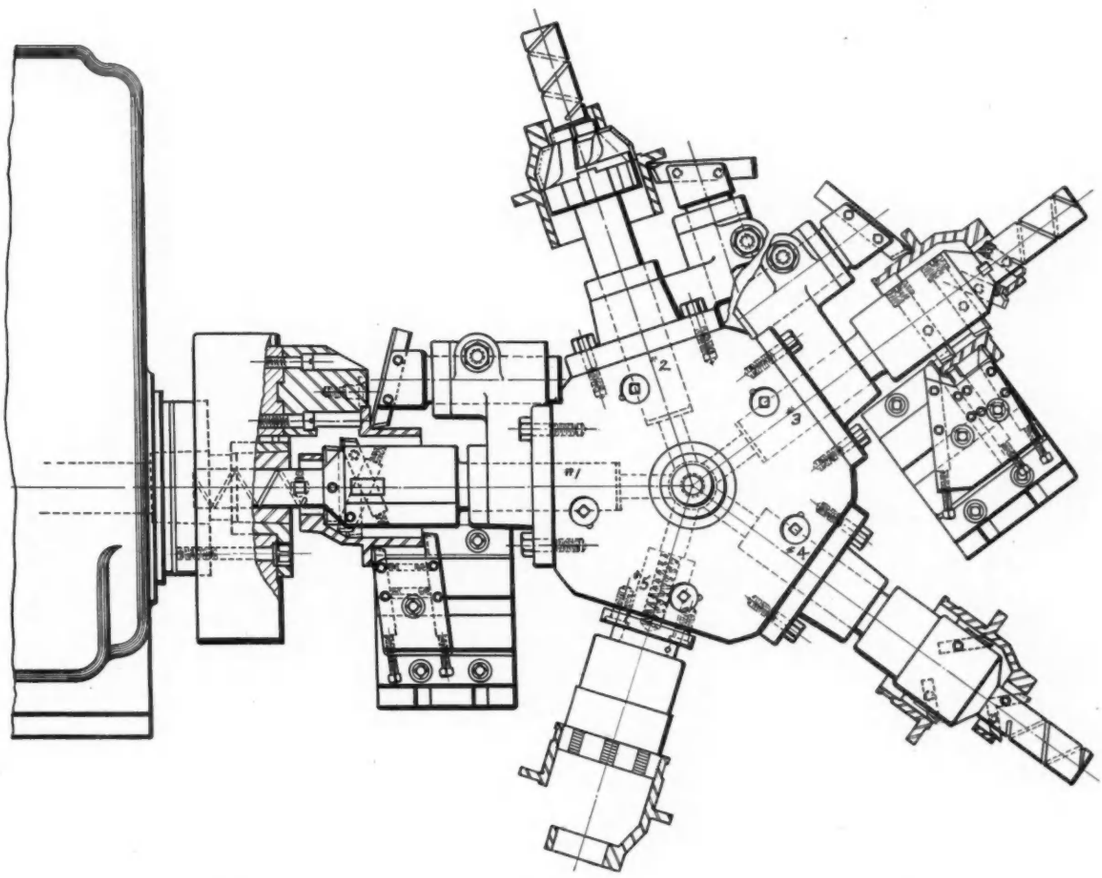
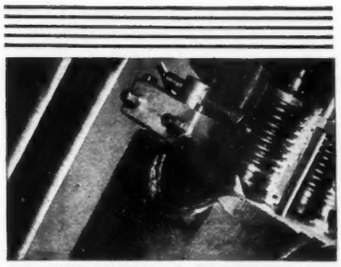


Fig. 2—The P&J 5-D Power-Flex was tooled to do a practically complete job

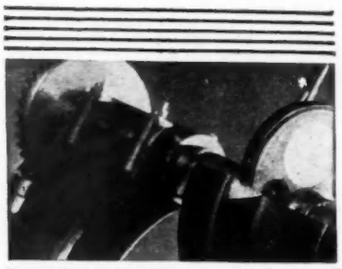
Automotive Oddities—By Pete Keenan

FIRST CROSS CANADA MOTORIST ONE OF THE MOST DIFFICULT JOURNEYS EVER MADE IN AN AUTOMOBILE. During one stage of the journey 10 miles per-week was averaged for seven weeks. 1931.
THE NOVA SCOTIAN
Ed Keenan
STEINMETZ, ELECTRICAL WIZARD, Who at one time designed an electric truck. WAS THE ONLY PERSON IN N.Y. STATE PERMITTED TO SMOKE IN A FACTORY. This required a special law.
A DOG AT THE BLACK HORSE HOTEL MEDIA. PA. WILL BARK AT NO OTHER CAR BUT A FORD
JAMES JANOKA RECEIVED HIS DRIVERS LICENSE AT 2 P.M. AND HAD IT REVOKED AT 2.30. P.M SAME DAY. He ran up a curb. Rumson N.J.
LICENSE
COUNT DE ROBILANT ITALIAN AVIATOR FORCED DOWN IN THE BRAZILIAN JUNGLES WITHOUT FOOD OR WATER FOUGHT HIS WAY THROUGH THE WILDS FOR THIRTEEN DAYS CARRYING HIS INJURED MECHANIC. May 2nd 1930.

Correspondence about "Automotive Oddities" is invited. Contributions used will receive editorial mention when practicable. If you are interested in the source of, or the reason for, a particular "Oddity," ask the editorial department of Automotive Industries about it.



NEWS OF THE INDUSTRY



Metal Congress Elects d'Arcambal

Herty's Lecture Feature of A.S.S.T. Sessions

BY JOSEPH GESCHELIN

BOSTON, Sept. 24—At the business meeting of the American Society for Steel Treating, which occurred this week during the most successful National Metal Congress held under the auspices of the association, A. H. d'Arcambal, consulting metallurgist for Pratt & Whitney, was elected president for 1932 of the sponsoring organization.

At the thirteenth annual National Metal Exposition, held during the Congress, many new products of interest to automotive production men and metallurgists were shown for the first time. These products included a tester for sheet metals, a torsion testing machine, an interesting universal gear tester and a magnetic tester for spring wire. A new electric air tempering furnace and a new type of polisher were also shown.

A feature of the Steel Treaters' program, which was held jointly with programs by the Society of Automotive Engineers, the American Society of Mechanical Engineers, the American Welding Society, and the Society of Mining and Metallurgical Engineers, was the sixth Campbell Lecture, given by Charles H. Herty, Jr., of the U. S. Bureau of Mines. Taking as his subject, "Non-Metallic Inclusions in Steel," Dr. Herty discussed the effects and control of "dirty" steel, and described the effects of a new electrolytic etch which shows up blow-holes. He made the important observation that "dirty" steel has no effect on the physical properties under certain normal conditions, and that it has no effect on resistance to corrosion. He suggested inspection of structures at magnification 100, pointing out that the chief effect of non-metallic inclusions on steel was on the crystalline structure during heat treatment.

IT is related that the far-sighted Wolsey reminded his liege lord, Henry VIII, that *as long as the people agreed,* the king's business was the king's business alone. The price of fame is notoriety, however, so Ford rumors reverberate over a domain far wider than the kingdom of the second of the Tudors. The people apparently do not agree that Mr. Ford's business is Mr. Ford's business alone. An army far larger than that of the pompous Henry of Greenwich serves the interests of the able and energetic Henry of Dearborn.

Telegraph wires have been humming from key distribution points telling how Ford dealers are expecting either a new model or a modified "A" sometime between the latter part of November and January 1. "Forty-five days stock on hand," "enough for 50 days," "requirements for two months," "90 days stock" indicate that it won't be long now. Detroit, Dame Rumor's stronghold, has been echoing with hearsay of longer wheelbase, new springing to reduce overall height, free wheeling with silent second, larger bore, ample rubber engine mountings and gas tank in rear. By the time some of these tid bits of gossip have traveled the rounds they have taken on some of the air of the authenticity—at least to the bearers of the alleged secrets of Dearborn.

But it is no secret in the field that Chevrolet and Plymouth are being watched with no little discomfort by Ford dealers everywhere. And news stories and gossip about other possible small cars make Ford sales just that much tougher.—*Leslie Peat.*

Driven a distance equal to eight times around the globe during twenty-two years of service on the road and still capable of a speed of 80 miles an hour is the exceptional record of a Knox Speedster automobile owned by David N. Singer, instructor in automotive engineering at the University of Kentucky, at Lexington. Mr. Singer purchased the car in 1909, the year it was made, and has driven it continuously ever since.

It has a four-cylinder, overhead valve motor, and the front axle, made by the Timken-Detroit Axle Co., is said to be the oldest one on record which is still in service. Mr. Singer still gets 20 miles to the gallon of gas, although the engine is a large one for the size of the car.

THE NEWS TRAILER

July Aircraft Exports Reported

Fifteen Complete Units and 52 Engines Shipped

WASHINGTON, Sept. 24—Fifteen aircraft, valued at $191,604, were exported during the month of July by American manufacturers, according to the Department of Commerce. During the month 52 aircraft engines, valued at $194,156, were exported, and shipments for export of aircraft parts and accessories were valued at $154,666.

No comparable figures for July of last year were available when the above report was issued.

Duggan Joins Thompson

Tom O. Duggan, for the past five years merchandising service director of the National Standard Parts Association, has joined the organization of Thompson Products, Inc., Cleveland, in the capacity of merchandising director. This announcement was made by Burke Patterson, Thompson service sales manager.

Starting his career in the industry in 1910. Mr. Duggan has been a mechanic, race driver, jobber sales manager, and merchandising service director. He also served as a pilot in the Army Air Corps during the war. During the past two years he has addressed more than 62,000 repairmen in all sections of the country.

The securing of Mr. Duggan is part of an extensive expansion program of Thompson Products in the replacement field, which will involve closer relationships with jobbers and the conduction of jobbers sales conferences and dealers clinics.

T. E. Reeder

DETROIT, Sept. 24 — Thomas E. Reeder, former president of the Federal Motor Truck Co., died yesterday, following an illness which lasted three months.

M. E. A. Chooses Temporary Staff

Dual Organization Planned to Function Until January 1

NEW YORK, Sept. 23—Reorganization plans of Motor and Equipment Association have now progressed to the point where the two resulting organizations, the Motor and Equipment Manufacturers' Association and the Motor and Equipment Wholesalers' Association, have chosen officers and directors to function until Jan. 1, 1932, when duly elected officers and directors will take office. The officers for 1932 will be elected at the convention to be held in Atlantic City, Dec. 7 to 12.

While the results from the mail ballot on the reorganization are not yet entirely in, such ballots as have been returned indicate almost a unanimous sentiment in favor of the reorganization.

The Motor and Equipment Manufacturers' Association has chosen as temporary officers: President, George L. Brunner, of the Brunner Mfg. Co.; vice-president, David Beecroft, Bendix Aviation Corp.; treasurer, C. H. Burr, SKF Industries, and secretary, C. C. Secrist, of the Victor Mfg. and Gasket Co. A. H. Eichholz, who has been functioning as assistant to the president of the present M.E.A., will become general manager of the Motor and Equipment Manufacturers' Association.

Board of directors of the M.E.M.A., in addition to the officers, will be: C. P. Brewster, of the K-D Mfg. Co.; C. C. Carlton, of Motor Wheel Corp.; F. S. Durham, of the Bonney Forge and Tool Works; J. C. Ferguson, of Eclipse Machine Co.; H. J. Lange, Marquette Mfg. Co.; J. M. McComb, of Crucible Steel Co. of America; Lothair Teetor, of Perfect Circle Co., and F. G. Wacker, of the Automotive Maintenance Machinery Co.

A temporary executive committee to function until Jan. 1, 1932, has been appointed, consisting of Mr. Brunner as chairman, and Messrs. Beecroft, Burr, Brewster and Teetor. Temporary finance committee consists of Mr. McComb, chairman, and Messrs. Burr and Carlton.

Officers of the Motor and Equipment Wholesalers' Association who will function until Jan. 1 are E. T. Satchell, now president of the M.E.A., as president; W. R. Crow, of Crow-Burlingame Co., Little Rock, Arkansas, vice-president; E. R. Seager, Pennsylvania Rubber and Supply Co., Cleveland, Ohio, treasurer; and A. V. Hall, of Sherwood-Hall Co., Grand Rapids, Michigan, as secretary. B. W. Ruark, sales promotion manager of the present association, will be general manager of the M.E.W.A.

Directors of this association, in addition to officers, will be C. F. Wright, of Ballou and Wright, Portland, Oregon; F. H. Floyd, of Ward-Dossett-Floyd Co., Waco, Texas; G. H. Niekamp, Beck & Corbitt Co., St. Louis, Mo.; F. V. Grimm, of Grimm-Hansen-Treland, Inc., Chicago, and G. B. Shearer, of Gaul, Derr & Shearer Co., Philadelphia.

Temporary executive committee will consist of Mr. Satchell as chairman and Messrs. Seager and Crow.

Stoughton Co. Expands

STOUGHTON, WIS., Sept. 21—The Stoughton Co., formerly the Stoughton Wagon Co., is inaugurating an expansion campaign which includes entry into the field of manufacturing trailers and a general line of motor truck equipment. Charles R. Jahn, for 20 years in automotive industries, and for several years sales manager of the Highway Trailer Co., Edgerton, Wis., has joined the Stoughton Co. as general manager of the new division, which was organized more than a year ago and has been engaged in experimentation since that time. A new principle of standardized production has been worked out to produce large savings in production costs. The Stoughton Wagon Co. was established 76 years ago, and while it has continued the manufacture of wagons, its more important activities in recent years have been in automotive lines, principally truck bodies and complete trucks. F. J. Vea is president.

Morse Books 6 Orders

CHICAGO, Sept. 21—Six orders from automobile manufacturers have been received in the last 30 days by the Morse Chain Co., Detroit and Ithaca, a division of Borg-Warner Corp. These new contracts were for timing sprockets and chains used as standard equipment on popular makes of cars. The company also has received two sizable contracts from the export field. This was announced today by C. S. Davis, president of the parent corporation.

C. S. McElwain

DETROIT, Sept. 22—C. S. McElwain, central advertising staff, General Motors Corp., died at his home yesterday. He was 45 years old. Prior to his connection with the central advertising staff of General Motors he was advertising manager of Oakland Motor Car Co.

Ex-Cell-O Reports Loss

DETROIT, Sept. 22—Ex-Cell-O Aircraft and Tool Corp., has reported net loss of $134,163 after all charges, for the six months ended June 30, 1931, compared with net profit in the same period last year of $68,187, equivalent to 18 cents a share on 376,725 no par shares of capital stock.

G. M. Cuts Pay For Salary Group

Reductions Range From 10 to 20 Per Cent on All Affected

NEW YORK, Sept. 22—Alfred P. Sloan, Jr., president of General Motors Corp., announced that effective Oct. 1 all salaries will be reduced from 10 to 20 per cent. This action does not involve hourly wage rates. The purpose of this is to establish a new base of salaries in line with standards of values now existing and in harmony with reduced costs of living.

The adjustment will take place on the following basis: annual salaries up to $3,000 inclusive 10 per cent; $3,001 to $10,000 12½ per cent; $10,001 to $20,000 15 per cent; $20,001 to $50,000 17½ per cent, and over $50,000 20 per cent.

Petroleum Imports Up

NEW YORK, Sept. 23—Imports of petroleum at the principal ports of the United States for the week ended Sept. 19 have been estimated by the American Petroleum Institute at 242,000 barrels daily. This compares with the daily average of 164,714 barrels for the week ended Sept. 12, and with 209,536 barrels daily for the four weeks ended Sept. 19. Crude runs to stills during the week are placed at 2,431,700 barrels daily. Cracked gasoline produced during the week was placed at 3,389,000 barrels.

Stocks of gasoline at bulk terminals and in transit, east of California, for the week ended Sept. 19, totaled 12,181,000 gallons, as compared with 11,612,000 gallons for the previous week, and with 13,311,000 gallons for the week ended Sept. 20, 1930.

Bosch Adds Lines

SPRINGFIELD, MASS., Sept. 22—United American Bosch Co. will put in production Oct. 1 a new automobile radio receiving set that will take energy from the regular battery of the car, using a 150-volt motor generator in place of a B battery. Automatic volume control is said to be a feature.

A new Bosch magneto for use on trucks and buses, as a protection in the event of battery ignition trouble, soon will go into production.

Budd Market Expands

NEW YORK, Sept. 21—Budd Wheel Co. is finding an expanding market for its recently introduced stainless steel Snap Spokes in foreign fields. Foreign distributors are being appointed and these Snap Spokes will shortly be available to motorists in the leading countries in the world.

Copper and Tin Rock on London

Steel Markets Ride Easy Through Cutter In Foreign Exchange

NEW YORK, Sept. 24—While suspension of the gold standard by Great Britain had little effect on the steel market, it did serve to dislocate severely the principal non-ferrous metal markets, especially so copper and tin. On the London Metal Exchange prices for the latter two were lifted sharply higher with a view to overcoming the spread between the U. S. gold dollar and the fluctuating pound sterling. Standard copper rose more than 5 pounds sterling and Straits tin 7 pounds 15 shillings on Monday, and the rising tendency continued on Tuesday. Lead and zinc were also marked higher, but to a more moderate degree.

In the copper market record-breaking lows had been reached at the end of last week, and the impact of the London situation intensified the prevailing dullness. Tin importers were also inclined to mark time until the situation in London reflected a more settled state. Until swings in sterling exchange become less violent, the price of tin will be more affected by that factor than by ups and downs on the London and Singapore metal exchanges.

Conditions in the steel market were virtually unchanged. According to the latest report of the National Association of Flat Rolled Steel Manufacturers, unfilled tonnage at the beginning of the month was 170,122 tons, as compared with 203,358 tons at the beginning of August, the backlog representing 47.9 per cent of capacity. Demand for cold-finished steel bars and for automotive alloy steels is a shade better with prices unchanged. A good deal of information is being sought as to prices by reason of contemplated changes in models.

Pig Iron—Small lot buying continues to feature the market. Malleable and foundry for Michigan shipment continue to be quoted at $17 @ $17.50.

Aluminum — Middle West secondary aluminum interests report a slowing down in demand for their alloys, and prices for these are easier. The market for virgin metal is unchanged.

Copper—According to American Bureau of Metal Statistics, world production of copper in August was 122,155 short tons as compared with 121,504 tons in July, the increase, slight as it was, weakening still further the statistical position of the market which is nominally quoted at 7c, delivered Connecticut Valley, the record low for all time.

Tin—Straits tin was nominally quoted at 23½c at the opening of the week's trading.

Lead — Somewhat more active and steady.

Zinc—Dull and easy.

Seiberling Sales Increase

NEW YORK, Sept. 21 — Seiberling Rubber Co. reports an increase in sales of tires to dealers of 46.95 per cent during the first seven months of this year, as compared with the corresponding period of 1930. The company's plant at Akron is now working three eight-hour shifts a day, according to F. A. Seiberling, president.

The company has just introduced a new type known as the air-cooled tire, through the tread of which air is forced at each revolution of the wheel. This results in dissipating the heat generated in the tread and makes possible a thicker tread, thus insuring longer tire life.

Cummins Engine Available

COLUMBUS, IND., Sept. 21—On his return from a coast-to-coast trip with one of his Diesel engines mounted in an Indiana truck chassis, C. L. Cummins, president of the Cummins Engine Co., told *Automotive Industries* that additional units of the 6 cylinder, 125 hp. type are being produced, and after thorough testing will be available for the use of any truck manufacturer. No exclusive license for the manufacture or use of the Cummins engine has been given to any outside organization, Mr. Cummins said.

Plans New Radio Series

NEW YORK, Sept. 26—General Motors radio program will follow a new outline commencing Monday evening, Oct. 12. The new program will be called the "Parade of States," each evening's program being devoted to one particular state and being built around the native songs, music, history and tradition of that state.

The Swope Plan Text

(Continued from page 479)

alent of X per cent of its export sales, this X per cent deemed to be the equivalent in selling price of the various provisions for the benefit of employees which the company must make under this plan and from which some foreign companies which the domestic companies have to meet in competition are free.

By this method American industry can discharge its obligation to its employees and, by holding its position in the markets of the world, bring additional work to America.

Timken Organizes Industrial Unit

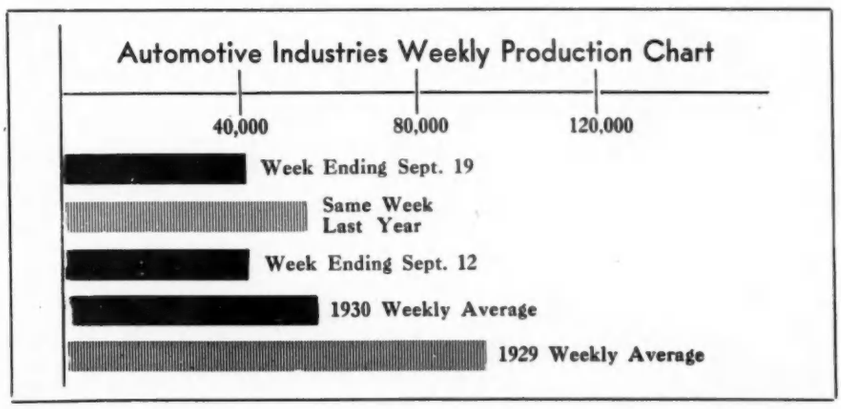
Will Manufacture Fittings for Pipe; Widening Activity

DETROIT, Sept. 22—Announcement is made here of the formation of The Timken-Michigan Co., which will manufacture and sell a complete line of lubricated and non-lubricated plug valves, and leak clamps for use on cast-iron bell and spigot pipe.

R. J. Goldie, vice-president and general manager of the Michigan Valve & Foundry Co., is president, and Fred Glover, president of the Timken-Detroit Axle Co., is vice-president of the new organization. W. C. Wood, secretary-treasurer of The Timken-Detroit Axle Co., will serve in a similar capacity with the new company. The board of directors includes D. S. Devor, vice-president in charge of manufacturing of The Timken-Detroit Axle Co., and W. F. Rockwell, president of the Pittsburgh Equitable Meter Co.

Oswell C. Heffinger

MILWAUKEE, Sept. 21—Oswell C. Heffinger, prominent in the automobile merchandising field for 30 years, and former president and general manager of the Chicago Motor Car Co., Chicago, died Sept. 18 at his present home in Milwaukee at the age of 53 years. He was born at Youngstown, Ohio, and began his career at the Packard factory in Detroit, later going to the Packard branch at Albany, N. Y. He first came to Milwaukee to become sales manager of the Welch Motor Car Co., Packard distributor in Wisconsin, going from there to Chicago in 1916. After 12 years as president of the Chicago Motor Car Co., he retired three years ago because of failing health and took up his residence with his father-in-law, Frank A. Walsh, in Milwaukee. He was the fifteenth president of the Chicago Automobile Trade Association and had served the association for many years.



Men of the Industry and What They Are Doing

Wyman-Gordon Shifts

George F. Fuller, former president of the Wyman-Gordon Co., Worcester, Mass., has been named chairman of the board, and Harry G. Stoddard, former vice-president, succeeds him as president. F. A. Ingalls has been re-elected vice-president; C. C. Winn, formerly assistant treasurer, has been elected treasurer at Worcester, and F. P. Miller, formerly cashier at Harvey, Ill., has been elected assistant treasurer at that works.

New executive appointments follow: S. M. Havens, formerly works manager at Harvey, now is general manager there; R. M. Powell, formerly sales agent at Detroit, now is general sales manager there; J. B. Sutherland, formerly general sales agent, now is assistant to president; H. F. Wood, formerly assistant works manager, now is works manager, Ingalls-Shepard division; J. H. Nelson was reappointed works manager, Worcester division, and F. E. Wellington is district sales manager, Worcester division.

Nash Named to Committee

Governor Philip F. LaFollette has appointed Charles W. Nash, president, Nash Motors Co., Kenosha, Wis., as one of seven citizens to serve on the new executive council created by the recent session of the state legislature to aid him and to consider possible legislation. Mr. Nash is one of two representatives of industry on the council, the membership of which numbers 20.

Chapin Article Published

Roy D. Chapin, chairman of the board of the Hudson Motor Car Co., and chairman of the Highways Committee of the National Automobile Chamber of Commerce, describes highway construction activities which are attaining record volume in enterprising Southern States, in an article published in the current issue of "Mississippi Highways."

Clayden Moved to Detroit

A. Ludlow Clayden, research engineer, the Sun Oil Co., has moved his headquarters from Philadelphia to Detroit, where he will be located in the first National Bank Building.

Knudsen Sails for England

W. S. Knudsen, president and general manager of the Chevrolet Motor Co., sailed on Sept. 23 for Southampton, England.

For many years Mr. Knudsen has followed the practice of making a biennial trip to Europe for the dual purpose of making a first hand study of European business conditions, and visiting his mother, who resides in Copenhagen, Denmark, the city of his birth.

Mr. Knudsen's itinerary, covering approximately five weeks, calls for a visit to the Paris salon, as well as several General Motors European plants.

Robbins Joins Thermo

W. C. Robbins, former chief engineer of the Houde Engineering Corp., Buffalo, and for the past two years vice-president in charge of the engineering and manufacturing of the Gabriel Shock Absorber Co., Cleveland, is now vice-president and general manager of the Thermo Hydraulic Shock Absorber Co., Cambridge, Mass.

Reo Names Eversman

George W. Eversman has been appointed director of advertising and sales promotion of Reo Motor Car Co., according to an announcement by E. G. Poxson, general sales manager. Mr. Eversman, who has been with Reo five years, was previously assistant sales promotion manager.

Tool Builders Honor Johnson

To show their appreciation of the work done in behalf of the National Machine Tool Builders Association during the past two years by Carl A. Johnson, president of the Gisholt Machine Tool Co., who is about to retire as association president, the directors held their fall meeting at Madison during the week of Sept. 14. They were guests of Mr. Johnson at a dinner, followed by a business session, at his residence. A sightseeing tour of the city, which is the state capital, and an inspection of the Gisholt shops, were other features of the day's program.

Baits Returns to Duty

Stuart G. Baits, chief engineer, Hudson Motor Car Co., returned to active duty recently. Mr. Baits has been away for a number of weeks following an automobile accident.

Harvey Firestone Returns

Harvey S. Firestone, president of Firestone Tire & Rubber Co., returned Sept. 20 with his family aboard the S.S. Leviathan from a trip to Europe.

Lawrence Returns to Europe

John V. Lawrence, European representative of the National Automobile Chamber of Commerce, sailed Sept. 23 aboard the S. S. George Washington to return to Paris after a stay of several weeks in this country.

Harrington Goes to Batavia

George P. Harrington, recently appointed regional manager of the Far East for General Motors, sailed Sept. 22 aboard the Bremen to take up his new duties in Batavia, Java. Mr. Harrington was formerly managing director of General Motors Java at Batavia.

Kettering Off for Europe

Charles F. Kettering, president of General Motors Research Corp., and vice-president of General Motors Corp., sailed Sept. 22 for Europe aboard the Bremen, accompanied by Mrs. Kettering.

Earl Sails for Europe

Harley J. Earl, chief designer, Fisher Body Corp., left for Europe Tuesday, Sept. 22, on the Bremen. Mr. Earl will visit General Motors plants in Germany and Norway and will return about Nov. 1.

Tainsh Returns to Factory

John Tainsh, sales manager of the Auburn Automobile Co., has returned to the factory following a trip through the Eastern States, visiting Auburn and Cord dealers and distributors.

A. D. Quinn

A. D. Quinn, sales manager of the industrial division of the L. H. Gilmer Co., Philadelphia, died in Chicago, of heart disease, on Sept. 17.

Hudson Names Spring

Frank S. Spring has been appointed engineering stylist for Hudson-Essex automobiles.

Marmon Names Hendricks

The resignation of E. A. Travis, vice-president and general manager of the Marmon Automobile Co. of New York, Inc., and the appointment of Jack Hendricks, Jr., to the post of acting general manager of the company are announced by officials of the Marmon Motor Car Co.

Parker Sales Increase

DETROIT, Sept. 21—Sales of chemicals by the Parker Rust-Proof Co. in the first eight months of 1931 were 40 per cent greater than in the corresponding period of 1930, according to a statement issued today by W. N. Cornelius, president.

More Miles of State Highway System Were Surfaced During 1930 Than During 1929

WASHINGTON, Sept. 21—The state highway systems were improved during 1930 by the surfacing of 27,464 miles of road and the improvement of 7813 miles to a point ready for surfacing, according to reports received by the Bureau of Public Roads, Department of Agriculture. The surfacing placed was 2393 miles greater than in 1929. New surfaces to afford improved traffic service were placed on 13,251 miles of old road, and on 14,213 miles not previously surfaced.

The state highway systems include 324,496 miles, of which 226,221 miles are now surfaced. This surfacing is composed of 84,112 miles of the higher types of roads (bituminous macadam, bituminous concrete, cement concrete, and brick) and 142,109 miles of low-type road (sand-clay, gravel, and water-bound macadam).

The roads built in 1930 by types were: Sand-clay, 2243 miles (8 per cent); gravel, 13,063 miles (48 per cent); waterbound macadam, 1371 miles (5 per cent); bituminous macadam, 1273 miles (5 per cent); bituminous concrete, 697 miles (2 per cent); cement concrete, 8789 miles (32 per cent); brick, 28 miles (less than 1 per cent).

Expenditures by state highway departments on roads in 1930 amounted to $980,000,000, or an increase of 22 per cent over 1929. Of this amount $713,000,000 was expended for construction, $191,700,000 for maintenance and the remainder for equipment, interest on bonds and miscellaneous purposes. The state highway departments also made other disbursements such as principal payments on bonds and transfers of funds to counties amounting to $160,000,000. Construction expenditures in 1930 were 28 per cent greater than in 1929.

A study of the sources of revenue shows that the state highway program was financed largely by motor vehicle and gasoline tax revenue and by bonds, the retirement of which is to be largely with motor vehicle funds. Property taxes and state appropriations, which once constituted the major sources of revenue, are now relatively unimportant. The total state highway income during the year was $1,136,673,437, derived as follows: Motor vehicle revenues, 26 per cent; gasoline taxes, 36 per cent; bonds, 20 per cent; Federal aid, 8 per cent; states taxes and appropriations, 4 per cent; funds transferred from counties, 5 per cent, and miscellaneous revenue, 1 per cent. At the beginning of 1930 a balance of $286,000,000 was on hand, which made the total funds available $1,423,000,000. Only nine states reported decreases in their incomes in 1930.

The figures as reported do not include the work done by counties, townships and other jurisdictions on local roads. The accompanying tabulation shows the condition of improvement of the state highway system at the end of 1930:

	Total Mileage in State System	Total Mileage Surfaced at End of 1930	Mileage Surfaced During 1930
Alabama	5,526	3,588	430
Arizona	2,633	1,864	80
Arkansas	8,810	6,866	1,782
Calif.	6,589	4,482	489
Colorado	9,234	4,375	246
Conn.	2,234	2,139	182
Delaware	817	817	82
Florida	6,663	3,794	224
Georgia	7,124	3,916	167
Idaho	4,565	2,759	614
Illinois	9,889	7,703	790
Indiana	6,111	5,986	543
Iowa	7,685	6,536	1,277
Kansas	8,690	4,240	1,775
Kentucky	15,000	8,154	728
Louisiana	10,509	7,549	1,411
Maine	2,039	1,886	116
Maryland	3,253	3,253	320
Mass.	1,624	1,624	88
Michigan	8,109	7,557	682
Minnesota	6,891	6,794	1,423
Miss.*	6,101	5,337	55
Missouri	8,446	5,638	939
Montana	8,148	1,846	200
Nebraska	9,752	4,784	796
Nevada	3,774	1,741	226
N. H.	2,548	2,434	219
New Jersey	1,873	1,841	177
N. Mexico	9,334	2,671	811
New York	14,015	11,244	964
N. C.	8,705	7,730	462
N. D.	7,401	3,183	630
Ohio	11,343	11,254	663
Oklahoma	6,395	3,341	395
Oregon	4,352	3,604	377
Penna.†	13,501	9,495	700
R. I.	1,009	571	47
S. C.	5,993	4,866	388
S. D.	5,976	3,984	366
Tenn.	7,044	5,960	497
Texas	18,703	10,808	968
Utah	3,436	1,904	259
Vermont	4,204	3,552	139
Virginia	7,688	5,602	357
Wash.	3,248	2,847	761
W. Va.	4,164	3,087	563
Wis.	10,221	9,365	1,825
Wyoming	3,127	1,650	231
Total	324,496	226,221	27,464

* Report covers 13 months ending January 31, 1931.

† Report covers year ending May 15, 1931.

Cites Show Influence

NEW YORK, Sept. 22—S. A. Miles, manager of the National Automobile Shows, has called upon all exhibitors to make the 1932 shows a real factor in restoration of business confidence.

The automotive industry, he points out, is one which has a wide influence on all American industries and an improvement in this industry will rapidly be reflected in other industries of the country. Therefore, every effort should be extended at the time of the new model introductions for 1932 to start the industry off on its right foot and give an impetus to industry in general. While immediate cash returns directly traceable to the shows can not be readily measured, the enthusiasm engendered by the shows in the automotive industry in particular, and in other industries in general, should be a vital factor in marking 1932 as the upturn.

There will be some 250 exhibitors in the car field and parts accessory and shop equipment divisions.

MAN Diesel Has Divided Chamber

Slows Combustion and Prevents Too-Rapid Rise in Pressures

(Continued from page 459)

ugal process. An interesting design feature is the offsetting of the liner from water-jacket wall, the jacket on one side of the cylinder having the same depth as the water-jacket and valve-rod chamber combined on the other side. This gives an engine of symmetrical outside form, a feature which has always had a strong appeal for M.A.N. designers.

Another M.A.N. design of the same cylinder dimensions is referred to in a recent article by A. E. Thiemann in Automobiltechnische Zeitschrift. The air pocket in the piston is omitted and the atomizer, which is a Bosch with four spray orifices, is mounted centrally in the cylinder head. A rim runs around the top of the piston and comes very close to the cylinder head at the end of the up-stroke. This prevents the sprays from coming in contact with the water-cooled cylinder walls and also tends to prevent dilution of the crankcase oil as a result of missed charges. The center of the piston head is raised and the depth of the compression chamber increases gradually from the center toward the rim, to conform to the shape of the spray cones. M.A.N. no longer uses the masked inlet valve to produce turbulence in the combustion chamber, and apparently the air in the chamber is substantially at rest during the injection period. This six-cylinder engine of 4.73-in. bore and 7.09-in. stroke develops 90 hp. at 1250 r.p.m., according to Thiemann, and a maximum of 100 hp., so that the b.m.e.p. is considerably greater than in the design first described.

One difficulty with small engines having direct fuel injection into the main combustion chamber is that they are unable to idle at low speeds without a smoky exhaust. This problem is solved in the M.A.N. design by cutting out three of the six cylinders when the engine has to idle, so that fuel is injected into three cylinders only, and the quantity of fuel injection is not reduced so much.

Dean C. Babcock

CLINTONVILLE, WIS., Sept. 21—Dean C. Babcock, 35, manager of divisional branch factories of the Four Wheel Drive Auto Co., died from the effects of an emergency operation for appendicitis at the Wausau hospital. He was born in Kaukauna, Wis., Oct. 30, 1896, and became associated with the FWD factory in 1920 as a salesman, being promoted in Jan., 1926, to be in charge of all the branch units maintained by the company.

M. E. A. Index Drops 6 Points

But Service Parts Sales Increased 3 Points in Month

NEW YORK, Sept. 24—August showed a six-point drop, as compared with July, according to the Motor & Equipment Association grand index, it was announced today. The July figure was 85 and August showed 79.

Service parts sales showed an increase of three points for the month, and accessory sales showed a nine point gain.

The detailed table follows:

	1931 Aug.	July	1930 Aug.
Original Equipment..	70	79	87
Service Parts	127	124	132
Accessories	66	57	60
Service Equipment ..	80	85	104
Grand Index	79	85	91
Wholesale Sales ...	100	100	114

Miller to Broadcast

L. A. Miller, president, Willys-Overland, Inc., Toledo, Ohio, was to speak over a coast-to-coast network of National Broadcasting Co.'s stations on Sunday, Sept. 27.

Mr. Miller will discuss the present business situation and outline what, in his estimation, are the economic steps which must be taken to bring a return of normal employment and buying.

Mr. Miller's address will be part of the inaugural broadcast of a regular weekly series to be sponsored by Willys-Overland.

Hendrickson Offers New Unit

CHICAGO, Sept. 22 — Hendrickson Motor Truck Co. announces a unit for conversion of a light duty truck into a six-wheeler, suitable for 1½-ton trucks. Introduction of this unit, for the first time, makes available in the light truck field an engineered four-rear-wheel unit complete. The new Hendrickson unit incorporates the same characteristics of the heavy duty six-wheeler.

Safety Congress Planned

CHICAGO, Sept. 22—Members of the twentieth annual safety congress and exposition will meet in the Stevens Hotel, Chicago, from Oct. 12 to 16, with more than 7000 attending and over 300 speakers. Outdoor traffic demonstrations and emphasis on the need for curbing the growing motor vehicle death toll will be featured at the meetings.

Thomas J. Hay Elected

CHICAGO, Sept. 22—Thomas J. Hay, veteran Chicago automobile dealer, has been elected general manager of the National Used Car Market Report, Inc., publishers of the "Red Book" and the "Blue Book," succeeding the late Timothy D. Beard. Mr. Hay has been closely identified with the "Market Report" from its inception and has been and is now a member of its board of directors.

Sterling to Exhibit New Engine

NEW YORK, Sept. 22—Sterling Engine Co. will exhibit at the American Electric Railway Association Show in Atlantic City, N. J., a new Sterling Petrel bus and truck engine rated at 150 net hp. at 1700 r.p.m. It has a bore of 5¼ in., a stroke of 6 in. and a displacement of 779 cu. in.

The company will also show its Viking eight-cylinder rail car engine with a bore of 8 in., a stroke of 9 in., and developing 565 hp. at 1200 r.p.m.

Leroy Manning

DETROIT, Sept. 21—Leroy Manning, chief test pilot, Ford Motor Co., was killed Saturday while testing an army bombing plane.

FWD Declares Dividend

CLINTONVILLE, WIS., Sept. 21—The Four Wheel Drive Auto Co., manufacturing FWD trucks, has declared a regular semi-annual 3 per cent cash dividend, payable Oct. 1 to stockholders of record Sept. 20.

Wiley Returns to Plant

AUBURN, IND., Sept. 24—Auburn sales at the Canadian National Exhibit, which closed in Toronto Sept. 12, were almost double those of last year, R. S. Wiley, export manager, announced today. Mr. Wiley has just returned to the states from a ten-day trip through the provinces.

Fremont Books 2 Orders

FREMONT, OHIO, Sept. 24—With new orders for 23 buses the Fremont Metal Body Co. has put on two shifts of employees for overtime production and officials of the company predict that it will continue on this basis until late in October.

Production at the plant is said to be the best in two years and prospects for added business during the next six months were declared to be extremely bright.

The company recently received an order for eight new buses from the Miami (Fla.) Transport Co., to be used in general passenger service throughout the South.

Separates Water from Gasoline

A device known as the Segregator, which serves to separate water from gasoline in which it is contained, has been adopted by the Army Air Corps. It is the invention of Master Sargeant David Samirah, and it was subjected to extensive tests by the Equipment Branch of the Experimental Engineering Section at Wright Field. The device is not being manufactured for the general market at present but has been recommended for use at all Army air stations in connection with aircraft refueling. It is believed that water in the fuel has been the cause of a number of crashes and it is therefore felt that the introduction of the new device will add to the safety of flying.

Segregators have been built and tested in many sizes. Among these are models for installation on gasoline delivery tank-trucks, in fueling-pit systems, for airports, filling-station installations, storage systems and fuel systems of aircraft and motor boats. A model designed for automobile use has been road-tested for about a year. The latest development is a model adapted for use with the standard Air Corps hand refueling pump. It is expected that this model will find wide commercial use in connection with filling station pumps.

New Aluminum Alloy

A Swedish metallurgist, J. Harden, of the Stockholm Metallographic Institute, has invented and perfected a new aluminum alloy, called Cromal, of unusual quality, uniting great hardness and tensile strength with the light weight of aluminum. The inventor is said to have been able by means of a special patented process, to solve the problem of uniting aluminum with chromium, a problem not before satisfactorily solved owing to the difficulty caused by the great dissimilarity in specific gravity between these two metals.

Cromal contains, besides aluminum, two to four per cent of chromium and small quantities of nickel and manganese. It has a tensile strength of 51,000 to 61,000 lb. per sq. in., a remarkably high degree of hardness equal to that of mild steel and great corrosion-resistance, as shown by extensive tests with soda solution and salt water. The metal is primarily suited for foundry work and has a casting temperature of 1300 deg. F. Owing to its great strength, low weight and non-corrosive qualities it is expected that Cromal will be of great importance in a number of different lines of metal manufacture, such as aeroplanes, propellers, etc.

Heated Inlet Manifold

A French inventor has secured a British patent on what may be called internal heating of the inlet manifold.

George M. Graham Heads New Company to Sell Low-Priced Six in Highly Competitive Field

DETROIT, Sept. 21 — A new low priced car, a six, competitive in the lowest priced market, is scheduled to make its appearance before show time, according to an announcement by George M. Graham, formerly vice-president, Willys Overland, Inc., who will head the sales activities of the new company which will produce and merchandise the cars.

Part of the announcement is contained in a twelve page booklet mailed to the entire trade list of the CHILTON CLASS JOURNAL COMPANY, publisher of *Automotive Industries*. According to this booklet the new car will be sold by an entirely new dealer organization, although the manufacturing company itself is sponsored by one of the larger corporations now producing automobiles. Information regarding the parent company, or other executives of the new company, aside from Mr. Graham, is being carefully guarded, as is the name of the car itself.

George M. Graham

In addition to the fact that the car will be a six, Mr. Graham revealed personally that it will have both free wheeling and "cushioned power," an engine mounting intended to prevent engine and transmission vibrations from being imparted to the frame and body of the car. The car will also be of longer wheelbase and greater roominess than usually expected in this price range, according to Mr. Graham.

"The introduction of this new car is based on a belief that two years of depression have changed the nation's buying habits," Mr. Graham stated at a dinner at the Detroit Athletic Club at which he revealed his and his associates' plans to a selected group among the trade and lay press last week. Continuing he said: "People want more for their dollar. At the end of every depression people gave their business to the manufacturer who was ready to provide most for the smallest money outlay." Mr. Graham further intimated that this condition would continue for at least two more years, and that in his opinion major profits both for the dealer and the manufacturer would be available most readily in the lowest priced field.

Mr. Graham further pointed out that during the depression people have not stopped using cars, and that a tremendous market is being built up for the replacement of cars now being rapidly worn out.

The car will be assembled in Detroit, Mr. Graham stated.

Before entering the automobile industry George M. Graham was set for a career in organized baseball. This idea he abandoned in favor of entering newspaper work, serving on the staff of the old Philadelphia *North American* for a time as automobile editor.

He entered the automobile industry through the advertising department of the Autocar Co., Ardmore, Pa. From there he made his first connection with Willys-Overland, later joining the Pierce-Arrow Motor Car Co., of which he became a vice-president. Leaving Pierce-Arrow to join Chandler he became vice-president in charge of all sales activities of the latter organization, before again joining Willys-Overland, in which company he was vice-president in charge of sales when he severed his connection a few months ago.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, Sept. 23—There was little change in general trade last week, with wholesale and jobbing lines at best only fair. Retail trade was affected by the unseasonably hot weather. Building activity has been slow, but the long-delayed public construction programs are getting under way.

MAIL ORDER SALES

Sales of three mail order houses during August amounted to $42,526,990, as against $48,244,998 a year ago. Sales of 43 store chains during August totaled $275,791,841, as against $291,899,444 a year ago.

RETAIL FOOD PRICES

Retail food prices in 51 American cities on Aug. 15 showed an average increase of ½ of 1 per cent above those a month earlier but a decrease of 16 2/3 per cent below those a year earlier.

CAR LOADINGS

Railway freight loadings during the week ended September 5 totaled 759,546 cars, which marks a decrease of 4,218 cars below those during the preceding week, a decrease of 97,103 cars below those a year ago, and a decrease of 258,935 cars below those two years ago.

COTTON CONSUMPTION

Cotton consumed during August amounted to 486,548 bales, including linters, as against 514,869 bales during the preceding month and 410,751 bales a year ago.

COTTON CLOTH OUTPUT

Production of cotton cloth during August, according to the Association of Cotton Textile Merchants of New York, totaled 209,050,000 yards. Shipments during that month were equivalent to 108.9 per cent of production and new orders were equivalent to 80.1 per cent.

CRUDE OIL OUTPUT

Average daily crude oil production for the week ended September 12 amounted to 1,919,000 barrels, as against 1,746,300 barrels for the preceding week, and 2,419,750 barrels a year ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended September 19 stood at 69, as against 68.9 for both the week and two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended September 16 were 18 per cent below those a year ago.

STOCK MARKET

The stock market last week suffered some bad breaks, with no substantial recoveries. The recession was particularly sharp on Friday. There was considerable forced selling, and the volume of trading was on a moderately large scale. During the week approximately 500 stocks dropped into new low ground for the year. There was a further decline on Monday, September 21, following the suspension of gold payments by the Bank of England.

BROKERS' LOANS

Brokers' loans in New York City during the week ended September 16 declined $54,000,000, bringing the total down to $1,271,000,000.

RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended September 16 showed increases of $3,000,000 in holdings of discounted bills, of $20,000,000 in holdings of bills bought in the open market, and of $14,000,000 in holdings of Government securities. The reserve ratio on September 16 was 78.4 per cent, as against 79.5 per cent a week earlier and 79.4 per cent two weeks earlier.

Metropolitan Section Meets

NEW YORK, Sept. 25 — "Lighter Than Air" was the subject of the first fall meeting of the Metropolitan Section, Society of Automotive Engineers, held here at the A.W.A. Building last evening.

V. R. Jacobs, assistant manager of the aeronautics department of the Goodyear Tire & Rubber Co., was the speaker and dealt considerably with the construction of the new airship "Akron." Discussion was led by C. B. Fritsche, J. C. Hunsaker and Ralph Upson.

The October meeting of this section will be held Oct. 22 and will have as a subject "The Passenger Car." This will be dealt with from three angles: First, "Is it cheaper to rent or own salesmen's cars?" Second, "The qualifications required in a passenger car fleet as compared with the individual passenger car." Third, "What the public wants in passenger cars."

July Aircraft Output Down

Military Production Declines Less Than That for Commerce

NEW YORK, Sept. 21 — American manufacturers of commercial aircraft and engines made deliveries valued at $1,210,406 during July of the current year, a decline of 22.4 per cent from July of last year when deliveries were valued at $1,559,522, according to the Aeronautical Chamber of Commerce, Inc.

Military aircraft delivered during the month were valued $2,051,044, a decline of 11.7 per cent from last year when deliveries were valued at $2,320,-213. Production during the month was valued at $3,254,132, as compared with $3,790,991, or a drop of 14.2 per cent. Total production for the first seven months of the year amounted to $21,846,043, as compared with $23,026,187 for the first seven months of last year.

Sales during the period were $22,-879,463, as compared with $23,412,075 for the corresponding period of a year ago. Military contracts this year amount to nearly two-thirds of the total of seven months' business, as compared with slightly less than half of a year ago.

In numbers, 176 commercial planes valued at $690,484, less engines, were produced in July, as compared with 196 units produced in the coresponding month of 1930 to the value of $915,224. Deliveries in July of this year totaled 180 units valued at $735,-182, as compared with 246 units valued at $1,143,697 a year ago.

Military production amounted to 61 units, as compared with 69 in 1930, or a value of $1,120,876, as compared with $1,309,625 last year. Deliveries of military planes amounted to 62 units valued at $1,139,776, as compared with 70 units valued at $1,339,-625 for that month of 1930.

Engine production during the month totaled 212 units for commercial purposes and 145 for military purposes, valued at $479,504 and $963,268 respectively. This compared with 162 commercial engines valued at $559,544 and 164 military engines valued at $966,588 in July of last year.

Sales of commercial engines in July were 208, valued at $475,224 and sales of military engines were 135, valued at $911,268. This compares with 145 commercial engines, valued at $415,825 and 166 military engines, valued at $980,588 in July of last year.

Powell Has New Lines

NEW YORK, Sept. 21—Powell Muffler Company, Utica, New York, has recently brought out a new Powell Auto-heater, and a new line of Multi-fit mufflers.

+ + CALENDAR + + OF COMING EVENTS

SHOWS

Olympia Passenger Car Show, London ..... Oct. 15-24
Olympia Truck Show, London .. Nov. 5-14
Passenger Car Show, Glasgow .. Nov. 13-21
Motorcycle Show, London .. Nov. 30-Dec. 5
Pittsburgh, Pa., Automobile ... Jan. 23-30
Newark, N. J., Automobile ..... Jan. 16-23
Salon, New York City ..... Nov. 29-Dec. 5
Cincinnati, Automobile ..... Jan. 17-23
Philadelphia, Automobile ..... Jan. 18-23
Detroit, Automobile ..... Jan. 23-30
Montreal, Automobile ..... Jan. 23-30
Pittsburgh, Automobile ..... Jan. 23-30
Baltimore, Automobile ..... Jan. 23-30
Salon, Chicago ..... Jan. 30-Feb. 6
Washington, D. C., Automobile ..... Jan. 30-Feb. 6
Cleveland, Automobile .... Jan. 30-Feb. 6
St. Louis, Automobile ..... Feb. 7-12
Kansas City, Automobile ..... Feb. 7-14
Peoria, Ill., Automobile ..... Feb. 9-14
Salon, Los Angeles, Calif. ..... Feb. 13-20
Salon, San Francisco, Calif. . Feb. 27-Mar. 5

CONVENTIONS

Eastern States Exposition, Springfield, Mass. ..... Sept. 20-26
American Electric Railway Assn., Atlantic City, N. J. ..... Sept. 26-Oct. 2
S.A.E. National Production Meeting, Detroit ..... Oct. 7-8
National Safety Council, Chicago, Ill. ..... Oct. 12-16
Society Industrial Engineers, Pittsburgh, Pa. ..... Oct. 14-16
Transportation Meeting, S.A.E., Washington, D. C. ..... Oct. 27-29
American Gear Mfg. Assn., Pittsburgh ..... Oct. 15-17
National Hardware Assn., Chicago, Oct. 19-22
American Iron and Steel Institute, New York City ..... Oct. 23
American Railway Assn.—Motor Transport Division, Chicago ..... Oct. 27-28
American Society Mechanical Engineers—Annual meeting, New York City ..... Nov. 30-Dec. 4
American Roadbuilders Association, Detroit, Mich. ..... Jan. 11-14, 1932
U. S. Good Roads Association, Birmingham, Ala. ..... Oct. 12-15
Associated Business Papers, Chicago, Ill. ..... Oct. 19-21

Goodyear Spreads Work

NEW YORK, Sept. 21—Goodyear Tire & Rubber Co. has inaugurated a plan whereby office and salaried employees will take two weeks' vacation without pay some time between Oct. 1 and Feb. 1. In announcing this plan, P. W. Litchfield, president of the company, stated that in this manner it was hoped the company would not find it necessary to lay off employees in this group, as it would spread out such work as it has among the largest number of people.

Millionth Canadian Ford Leaves Lines

MONTREAL, Sept. 22 — The one-millionth Ford car made in Canada is to be displayed in Montreal shortly, according to P. N. Mainguy, manager of the Montreal branch of the Ford Motor Co. of Canada, Ltd. The historic car will stop in Montreal for a short time before continuing a tour of eastern Canadian cities. During its stay here a number of prominent citizens will be given rides in the car and this town sedan finished in maroon will head a parade about the city of a number of Ford models from the local showrooms.

Petroleum Year Book Off Press

NEW YORK, Sept. 21—American Petroleum Institute has just published the fourth edition of its year book, "Petroleum Facts and Figures." The new features in this edition cover price records of crude and refined petroleum products, production and utilization of asphalt, state taxation of gasoline, and a two-page chart showing the trend of prices for 36-gravity mid-continent crude oil and service station prices of gasoline for 1924 to 1931.

Marketing Ford Fan

DETROIT, Sept. 21—Automotive Fan and Bearing Co. is now marketing a four-bladed Ford replacement fan with the blades set at an angle to each other. That is, there is less than 90 deg. between the blades on one side and more than 90 deg. at the other. This design is intended to produce quieter operation and also is claimed to provide a 40 per cent greater airflow capacity. List price is $5.00.

Du Pont Line Sales Up

WILMINGTON, DEL., Sept. 21—The automotive finishes division of the du Pont Co. reports that the August sales of their No. 7 line were the largest in any month this year. Reports indicate that they were fourteen per cent greater than for the same month last year.

N. Y. Dept. Buys Grahams

NEW YORK, Sept. 21—C. H. Jennings Corp. has just delivered to the New York City Fire Department 20 Graham sedans for use of battalion chiefs. These cars are standard in every particular except body color, which, of course, is red.

Budd Wheel Gets Order

PHILADELPHIA, Sept. 22 — The Budd Wheel Co. has just secured an order from an automobile manufacturer for the new steel artillery type wheel, according to an announcement made here today. Deliveries on this order are to start next month.

BARBER-COLMAN

TIME AND MONEY SAVERS

It is good economy to use Barber-Colman Inserted Blade Chucking Reamers, for they not only give exceptionally long service because of their high quality, but they may be accurately resharpened to their original diameter. They have a diameter adjustment for wear ranging from .039″ to .174″, according to size. In addition to their economy on the job, these Reamers have a distinctively original style of blade mounting which generally makes possible the use of more blades than other inserted blade reamers. Up to 11/16″, Barber-Colman Chucking Reamers have 4 blades; from 13/16″ to 17/16″, 6 blades; from 1½″ to 2 15/16″, 8 blades; while the 3″ Reamer has 10 blades. We make these fine tools with high speed steel blades, and can ship promptly from stock in sizes from 5/8″ to 3″ by sixteenths, straight or spiral blade and straight or Morse taper shank. Overall length and shank dimensions are standard. In order to obtain the most accurate results, spiral blade reamers are best sharpened on the Barber-Colman Reamer Sharpening Machine.

BARBER B-C COLMAN

BARBER-COLMAN COMPANY

General Offices and Plant

ROCKFORD, ILLINOIS, U. S. A.

Metal Congress and Exposition at Boston 50 Per Cent Greater Than 1930

(Continued from page 468)

and the best results were obtained with the latter, which is thought to be due to the fact that with them the sparks passed directly to the specimens.

Experiments were made also with ultra-violet light (from a special quartz mercury vapor lamp extending through the tube). Dissociation under these conditions was found to be quite high, and it was found possible to produce hard, satisfactory cases in a short time.

Remarkable improvements in the results were obtained by heating the nitriding container in a high-frequency electric induction furnace. This is in line with results reported by a French investigator, Mahoux.

Most of the processes covered in the paper require further development to adopt them to practical requirements, but the use of the ammonia-nitric oxide mixture should fit rather readily into routine practice, since it involves no great departure save the proper premixing of the gases and the use of the copper gauze or chips. In addition, the production of cases 0.01 in. in depth in four hours should insure its ready acceptance by the industry.

Shows Relation Between Wear and Hardness of Steel

A PAPER on "The Resistance to Wear of Carbon Steels" was presented before the A.S.S.T. Sept. 21 by Samuel J. Rosenberg of the Bureau of Standards. The wear referred to is metal-to-metal wear. Tests were made in the Amsler wear testing machine and the specimens consisted of small cylinders 2 in. in diameter by 0.4 in. thick, finish-ground to size.

All steels were tested against an arbitrarily selected "standard" steel, which contained 0.81 per cent carbon, was normalized at 1490 deg. Fahr., water-quenched from 1435 deg. Fahr., and tempered at 500 deg. Fahr. The Rockwell C scale hardness resulting from this treatment was just under 60. In all tests the "standard" specimen was mounted on the lower shaft of the machine, which rotated at about 220 r.p.m. The test specimen was mounted on the upper shaft, which rotated at 200 r.p.m.

In addition to the slip resulting from this difference in speed, the cam which is available on the Amsler machine for producing lateral motion of the upper specimen was used. Wear was measured by the losses in weight of both specimens.

When specimens are tested in the Amsler machine, a surface film forms on them which accelerates wear. It was found that when the same steels were inclosed in a gas-tight cell filled with nitrogen, and tested under the same conditions of speed and pressure as before, no wear took place, the test surfaces being smooth and bright at the end of the test. These films are a natural result of the rolling and sliding abrasion of steel against steel under heavy pressure in the presence of air and the absence of lubrication.

When two specimens of the same steel, which have also been given the same treatment, are tested in the Amsler machine, the upper specimen, which travels at the lower angular velocity, loses more weight than the lower. The appearances of the films produced are quite different, that on the lower specimen being much heavier. The explanation is offered for the greater loss in weight of the upper specimen that the lower specimen is protected by the heavier film upon it.

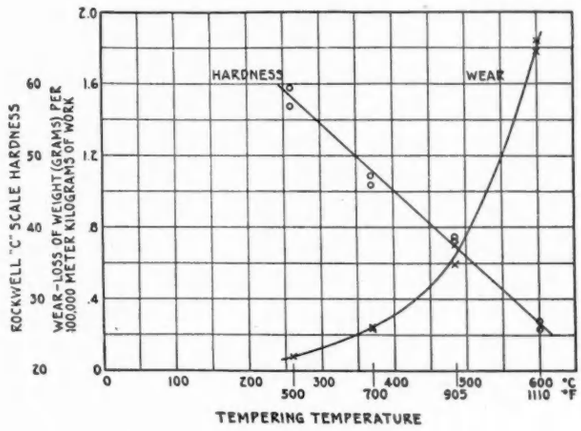
The loss in weight was plotted both against the slip and the work done in moving one specimen over the other, and it was found that results more truly indicative of the quality of the material are obtained if the wear is correlated with the work done in causing it.

The wear per unit of work of the upper specimen decreased as the pressure increased, this decrease becoming less with increasing pressure. The lower specimen, on the other hand, showed an increased amount of wear per unit of work as the pressure increased. This would seem to indicate that were the pressure sufficiently great the upper and lower specimens would both lose the same amount of weight. This, however, seems improbable because the curves show evidences of becoming asymtotic.

A load of 60 kg. was used in all tests, and this gave a specific surface pressure of 74,000 lb. per sq. in., according to the Hertz formula.

The carbon content apparently had little effect

(Turn to page 494, please)



Sketch indicating nature of stresses in the material of the blank when drawing cylindrical shell + + + + + +

QUIETING GEAR OPERATION COMES NEARER

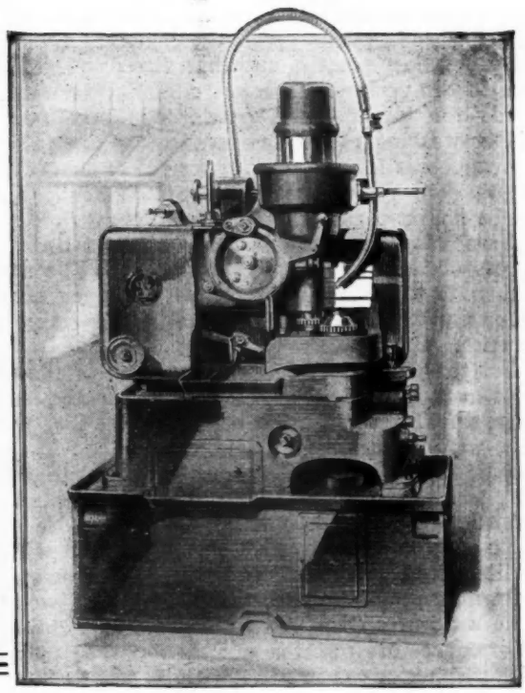
√ √ √ √ √

The possibilities, today, in improving gear operation are such that not to capitalize them places your sales campaign under a competitive handicap. It is not enough to rely on the Fellows Gear Shaper. You need Original Fellows Cutters—for their greater factor of safety in maintaining accuracy, and because they are the means by which Fellows Service can help you to improve your product. *** The sales advantage of improving your gearing is an advantage that is worth more today than ever before. The Automotive Industry is pointing the way. The helical gear transmission is a revolutionary achievement in quieting gear operation. What can you do to improve your product? *** One direct way is to ask to have a Fellows Sales Engineer call, and explain the latest developments toward quieting gear operation. Write: THE FELLOWS GEAR SHAPER COMPANY, 78 River St., Springfield, Vermont (Detroit, 616 Fisher Building).

As You Apply Fellows Gear Shaper Methods to CONTROL

PRODUCTION ACCURACY

- √ *True Generating Principle*
- √ *Simple Mechanical Motions*
- √ *Positive Cutter Control*
- √ *Continuous Rotating Indexing*
- √ *Generated Involute Control*
- √ *Laboratory Cutter Accuracy*
- √ *Controlled Inspection Methods*



The Fellows High Speed Gear Shaper stands alone in producing uniformly good gears.

FELLOWS
GEAR SHAPERS

upon the wear of annealed steels. Rather surprisingly, the wear of the low-carbon normalized steels was greater than that of the annealed steels of similar carbon content, but with increasing carbon content the wear rate of the normalized steels decreased rapidly, approaching, in the high carbon range, the relatively high wear-resistance of the hardened steels. The wear of the hardened steels decreased rapidly and regularly with increasing carbon content in the lower ranges of carbon. In the higher ranges, however, increased carbon did not materially affect the wear-resistance.

The effects of the tempering temperature on the wear-resistance of the 0.81 per cent carbon steel studied, and the results, together with the hardnesses, are given in Fig. 1.

Demonstrates Control of Nickel and Chrome Alloys

A PROCESS capable of more perfect control of nickel and chromium alloys with engine cylinder cast iron was described by F. W. Shipley, foundry metallurgist for the Caterpillar Tractor Co., at the Society of Automotive Engineers' session on Sept. 23. His paper was entitled "Characteristics of Alloyed Cast Iron."

Different combinations of these alloys were used, and it was found that a ratio of three parts of nickel to one of chromium gave the greatest improvement in structure in conjunction with maximum hardness. Effect of prolonged heating on three representative plain irons as well as on three nickel-chromium-alloyed irons of the same base composition is also shown, and here again a marked difference is revealed in favor of alloyed irons. A method of producing chilled roller wheels by additions of chromium instead of special cupola charges is given.

The speaker pointed out that the development of iron for internal combustion engines increased demands for better quality, improved structure and greater wearing properties because the modern trend is toward smaller but more powerful engines, higher compression, higher speeds, more cylinders per block and increased combustion temperatures.

These requirements exhausted the ordinary resources of the production foundry, so it was natural to turn to other available means of improving cast irons; thus the use of alloying elements was a consequence.

"For the purpose of determining some of the qualities which might be obtained through the use of alloys, the research work described in the present paper was conducted," he said.

In his summary, Mr. Shipley pointed out that chromium in iron increases the hardness, strength, etc., by combining the carbon and producing a more stable double carbide of iron which crystallizes out with the pearlite, while nickel tends to dissolve this free cementite-forming pearlite. A combination of the two alloys in the ratio of approximately 3 nickel to 1 chromium will produce an iron for automotive type cylinders which is superior to plain iron with respect to hardness, strength and microscopic structure. The percentage increase of these properties varies as the per cent of alloys used.

Increased Brinell hardness if accompanied by excessive free cementite is not desirable, but when produced by a pearlitic or pearlitic-sorbitic structure it is an indication of increased quality.

Nickel-chromium alloyed irons are much superior with respect to heat-resistant properties than ordinary irons.

Irons alloyed with chromium produce a superior chill and afford a practical method for production of special castings of this type, he concluded.

Predicts Hardening by Refrigerant Treatment

EFFECTS of low temperatures on metals are generally of an unfavorable character, and little is known regarding possibilities of improving metals by low-temperature treatment. This subject in relation to nickel chromium irons, or stainless irons, has been investigated by Vsevolod Krivobok and Maxwell Gensamer, of the Carnegie Institute of Technology, who presented their findings in a paper read before the American Institute of Mining and Metallurgical Engineers at its Boston meeting.

The effects of the low temperatures may be studied in two ways, viz., by determining such properties as the tensile strength, hardness, impact resistance, etc., at the low temperature, and by determining the same properties after the metal has been subjected to the low temperature and allowed to return to room temperature.

It is found that when the alloyed irons are thus subjected to a low-temperature treatment and then allowed to return to room temperature, their properties are not the same as before they were given the treatment; in other words, subjecting the alloys to a low-temperature treatment results in an irreversible change in mechanical properties.

Following is a summary of the results obtained by these investigators:

Certain chromium and chromium-nickel steels in the stainless range can be hardened by a treatment consisting of a rapid cooling to room temperature followed by immersion into a liquid well below room temperature. A mixture of solid carbon dioxide and acetone provides a sufficiently low temperature to accomplish this increase in hardness, which in several alloys has resulted in hardness of over 50 Rockwell C.

Dilatometric observations were made in studying the process of hardening. It was demonstrated that the increase in hardness is due to the decomposition of austenite at low temperatures and that the progress of the phase change is a function of temperature. Only a few minutes are necessary to establish a quasi-equilibrium between the retained, metastable austenite and the chromium-nickel ferrite and carbides, at any temperature.

The effect of nickel on iron and chromium alloys containing about 18 per cent chromium is to lower the temperature at which the gamma to alpha transformation occurs on cooling, and to oppose raising this temperature by "soaking," as can be accomplished in iron and chromium alloys containing little or no nickel. The effect of carbon is the same in this latter respect, but its effects on the temperature of transformation on cooling is less than that of nickel. With 0.05 per cent carbon between 4 and 8 per cent nickel is necessary to retain some of the austenite on quenching, but as the carbon content is increased to about 0.25 per cent, 2 per cent nickel is sufficient.